M2343K/M2344K MICRO-DISK DRIVES

OEM MANUAL

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CHAPTER 1 GENERAL

1.1 Introduction

This manual describes Fujitsu 8-inch rigid disk drive models, M2343K/M2344K. These drives contain non-removable disks in sealed modules. A rotary actuator using a closed loop servo performs head positioning.

These drives have floppy disk drive dimensions and can be mounted horizontally two drives wide in a 19-inch rack (with 3 pitch) or mounted vertically in a system cabinet.

The contact start/stop (CSS) type heads and media are of the Winchester technology type. These drives feature high performance, high reliability and low cost.

The maximum unformatted storage capacities of the M2343K and M2344K drives are 383.4 MB and 690.1 MB, respectively.

The drive utilizes a modified version of the industry standard SMD interface allowing drives to be added to an existing disk configuration.

By standardizing on this interface, development time for controllers and software will be substantially reduced. Sector size is user selectable from 1 to 128 sectors per track.

To power the drives only DC voltages of +24, +5 and −12 V are required, allowing for international versatility. Total power consumption is less than 170 W.

1.2 Features

(1) High reliability

(a) Winchester type technology contact-start/stop (CSS) heads and media are used. The heads are returned to landing zone during spindle start and stop functions.

(b) Each head has an LSI circuit on its arm to amplify the small signal thereby reducting read errors by increasing the signal to noise ratio.

(c) The heads, media and positioning mechanism are provided with a closed-loop air filtration system in a sealed disk enclosure (DE).

(d) The electrical components located in the DE are minimized to provide with increased reliability and repairability.

(2) Maintainability

No scheduled maintenance is required.
The use of a built-in DC spindle motor (no belt), completely sealed DE, plus highly reliable PCAs greatly reduce the necessity for maintenance.

In addition, no adjustment is required for exchanging PCAs executing "Calibration Seek" operation. For the facility of maintenance, optional "Diagnostic Panel Unit" is available, which has the functions of seek exerciser, unit status monitor and error logging.

(3) Compact, lightweight

This drive can be mounted two drives across in a standard 19-inch rack. The dimensions are almost floppy disk drive compatible. The weight of the drive is approximately 39 pounds (17 kg).

(4) Vertical/horizontal mount capability

These drives may be mounted vertically (On-side or On-end) or horizontally.

(5) Low accoustical noise level and low vibration make these drives attractive for an office environment.

(6) Since this drive requires only DC voltages, only one configuration is required for domestic and foreign applications.

CHAPTER 2 SPECIFICATIONS

2.1 Functional Specifications

Table 2.1 Functional specification

Model Item	M2343K	M2344K
Storage Capacity (Unformatted)	383.4 MB	690.1 MB
Number of Cylinders	624	624
Tracks of Cylinder	15	27
Cylinder Capacity	614,400 bytes	1,105,920 bytes
Track Capacity	40,960 bytes	
Number of Sectors	1 to 128	64
Average Rotational Latency	8.3 ms	
Positioning Time Track to Track Average Maximum	 4 ms 16 ms 33 ms	
Rotational speed	3,600 rpm ±1 %	
Transfer Rate	2.458 MB/s	
Encoding method	RLL (2/7)	
Interface Data	NRZ	
Recording Density	20,766 BPI	
Track Density (Inner zone/Outer zone)	849/1,045 TPI	
Start/Stop time	< 50/ < 40 sec.	
Interface	SMD (modified)	
Dimension Width×height×depth	8.5 in. (216 mm)×5.0 in. (127 mm) ×15.0 in. (380 mm)	
Weight	Approx. 39 lbs. (17 kg)	
Mounting axis	Horizontal or vertical	

2.1.1 Positioning time

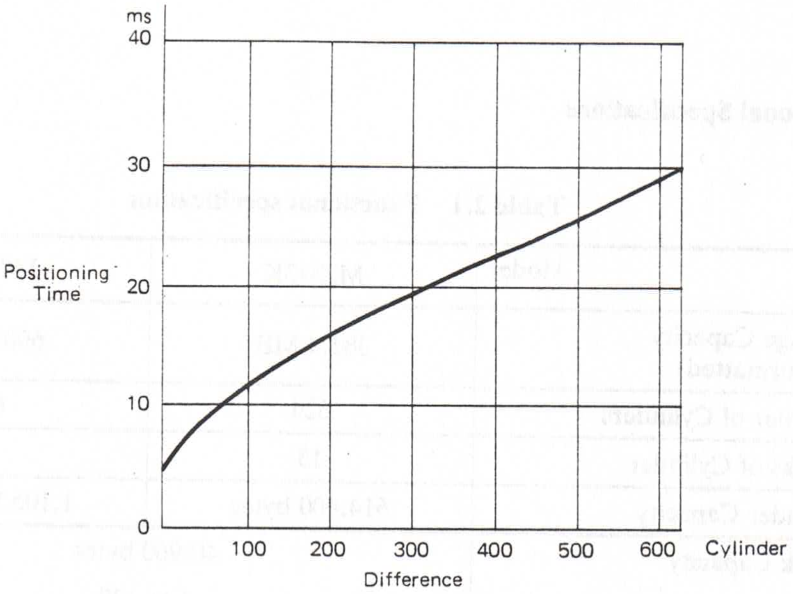


Figure 2.1 Positioning time profile

2.2 Physical Specifications

Table 2.2 Posioning time profile

Operating	
Temperature	41°F to 104°F (5°C to 40°C)
Relative Humidity	20 % to 80 % (no condensation)
Temperature Variation	<27°F/hr (15°/hr) (no condensation)
Altitute	10,000 feet (3,000 m)
Vibration	0.2G max. (3 Hz to 60 Hz) Both ways 2 minutes × 30 cycle (sine wave) (Including resonance frequency.)
Shock	2.0G, 10 ms
Non-operating	
Temperature	−40°F to 140°F (−40°C to 60°C)
Relative Humidity	5 % to 95 % (no condensation)
Altitute	40,000 feet (12,000 m)
Vibration	0.4G max. (3 Hz to 60 Hz) Both ways 2 minutes × 30 cycle (sine wave) (Including resonance frequency)
Shock	15G, 10 ms−in storage or during transportation

2.3 DC Power Requirements

2.3.1 DC power requirements

This drive requires +5V, −12V and +24V DC voltage from the optional power supply or system power supply. Each load current required by the drive is shown in Table 2.3.

Table 2.3 DC power requirements

DC Voltage	Load Current (Basic)	Load Currnet (With dual port)
+5 V ±5 %	3.5 A	4.5 A
−12 V ±5 %	3.5 A	4.5 A
+24 V ±10 %	4.5 Arms (Effective, typical) 9.0 Ao-p (Maximum) 5.5 Arms (POWER ON; Effective typical)	

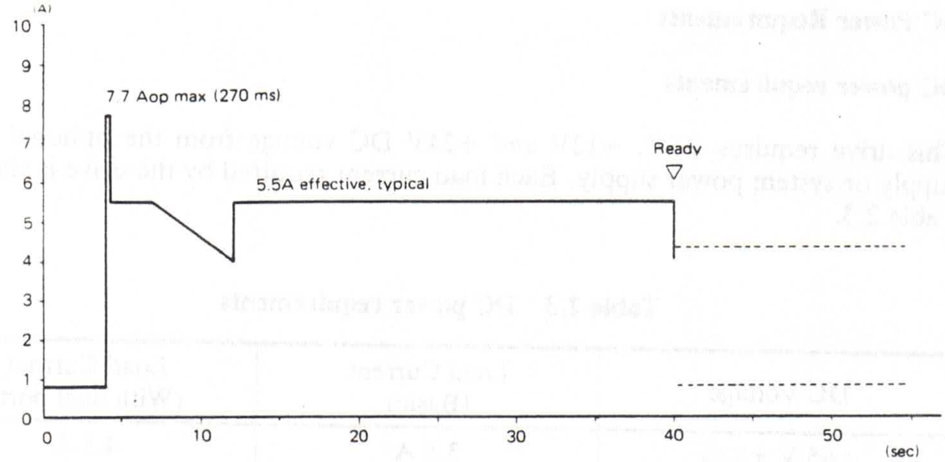
The load currents of +5V and −12V DC will be stable regardless of operation performed within the drive, however, the load current of +24V DC will be varied through a power up sequence, DC motor acceleration and/or seek operation.

DC voltages must be maintained within their tolerance while operation.

Note:

All DC return lines must be made electrically common at the power supply when using a power supply other than the unit supplied by Fujitsu. Failure to commonize the returns will result in premature failure of the motor circuit.

The +24V DC load current profile during power up sequence is shown in Figure 2.2.



Note:

Start up timing is delayed according to the SW5 on the main PCA. See Subsection 4.6.10 for details.

Figure 2.2 +24 V DC load current on power up sequence

The +24V DC load current profile during the repeated acceleration/inertia modes of DC motor and/or seek operation after Ready status is shown in Figure 2.3.

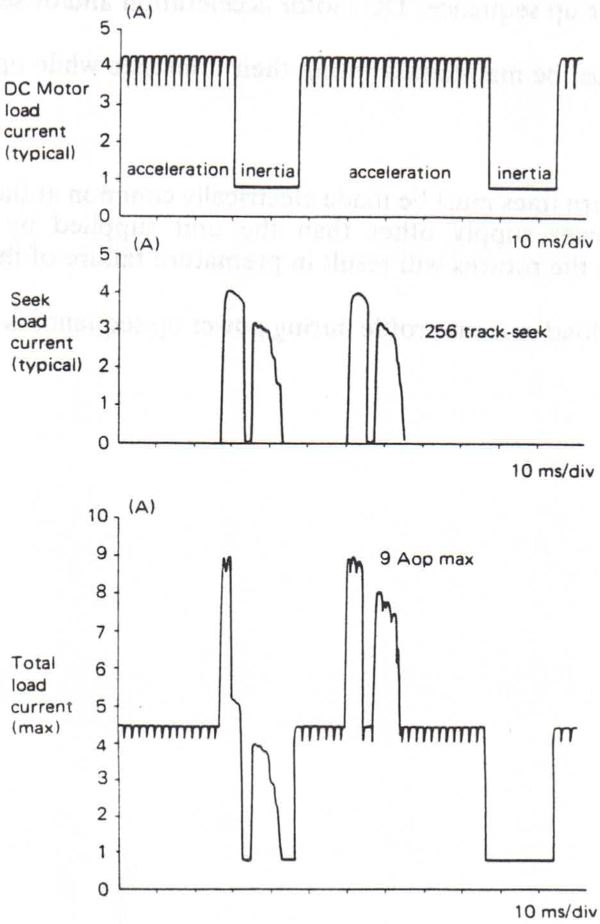


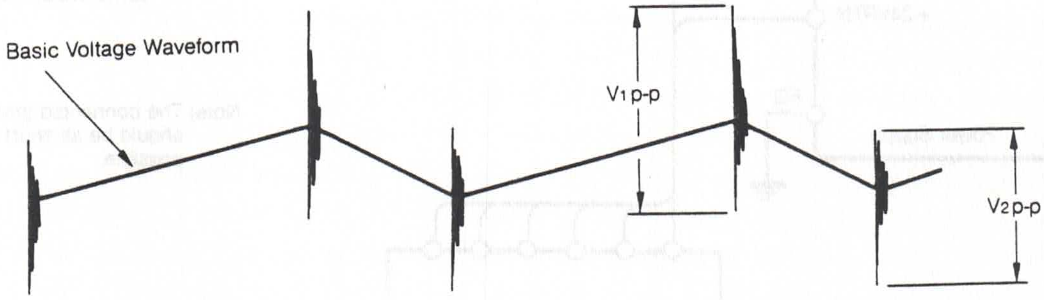
Figure 2.3 Total +24 V DC load current (Ready)

2.3.2 High frequency noise specification

When the DC power is supplied to the drive from a customer power supply with switching type regulation, the high frequency noise caused by switching regulator should be specified as follows.

(1) High frequency noise definition

It is defined that the high frequency noise is caused by a switching transient on basic voltage within the switching type regulator on the power supply unit as shown in Figure 2.4.



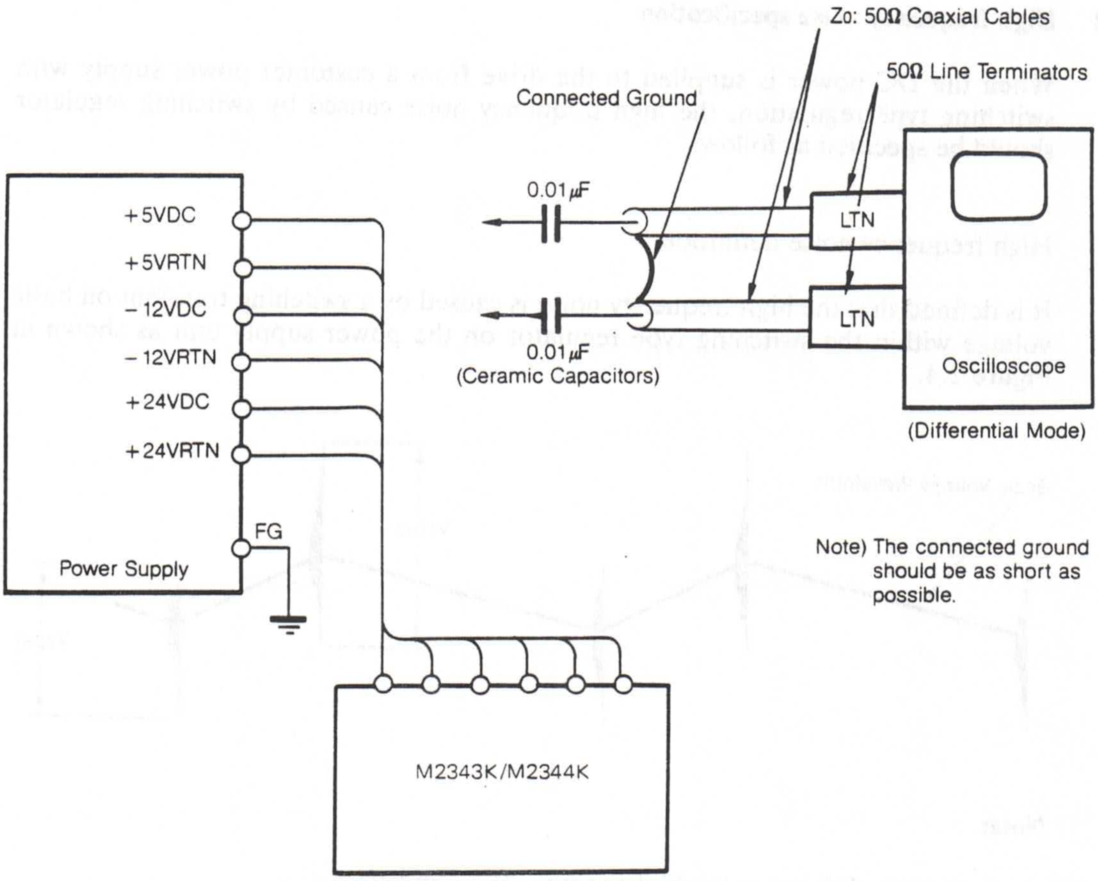
Note:

A noise is defined as the higher spike, $V_{1p\text{-}p}$ and $V_{2p\text{-}p}$

Figure 2.4 High frequency noise

(2) Measurement procedure

A noise level should be measured on terminals of the power supply as shown in Figure 2.5.



Note) The connected ground should be as short as possible.

Figure 2.5 Measurement procedure

(3) Noise specification

a. Noise between each DC output and return terminals.

V_{N1}: 0.1 $V_{p\text{-}p}$ max.

b. Noise between each terminal (DC output and return) and Frame Ground (FG).

V_{N2}: 1.0 V max.

c. This specification is not applied on an external linenoise definition.

2.4 Reliability

(1) MTBF

The MTBF is defined as follows:

$$\text{MTBF} = \frac{\text{Operating Time (hours)}}{\text{The number of Equipment Failures}}$$

The MTBF shall exceed 35,000 hours when estimated by the drives each having statistically significant operating hours (more than 6,000 hours). Operating hours means total power-on hours without any maintenance time. Equipment Failurs are defined as any stoppage or substandard performance of the equipment which necessitates repairs, replacements or re-adjustments on an unscheduled basis, excluding those caused by operator error, cable failure or other malfunction not caused by the equipment.

(2) MTTR

MTTR is the average time a well-trained service mechanic should take to diagnose and repair the trouble. This drive is designed for an MTTR of 30 minutes or less.

(3) Preventive maintenance time

No scheduled maintenance is required.

(4) Service life

This drive is designed to provide a useful life of at least five (5) years before factory refurbishment is required.

(5) Data security

Data integrity is assured in the event of a power failure except on the sectors where a write operation was being performed.

2.5 Error Rate

The following error rates assume that this drive is being operated within specification. Errors caused by known media defects or equipment failures are excluded.

2.5.1 Read errors

Prior to determination of a read error rate, the data shall have been verified as written correctly and all media defects flagged.

(1) Recoverable error rate

A recoverable read error is one which can be read correctly within sixteen retries when reading on track, and should not exceed ten per 10^{11} bits.

(2) Unrecoverable error rate

An unrecoverable read error is one which cannot be read correctly within sixteen retries and should not exceed ten per 10^{14} bits.

2.5.2 Positioning error rate

The positioning error which can be corrected within one retry should not exceed ten per 10^8 seeks.

2.5.3 Media defects

A media defect is defined as a repeative read error that occurs on a properly adjusted drive within specific operating conditions.

(1) Media defect characteristics

(a) The maximum number of defects per drive is as follows:

M2343K	383.4 MB: 400
M2344K	690.1 MB: 700

(b) The maximum number of defective tracks per drive is as follows:

M2343K	383.4 MB: 32
M2344K	690.1 MB: 45

A defective track is defined as a track having any of following:

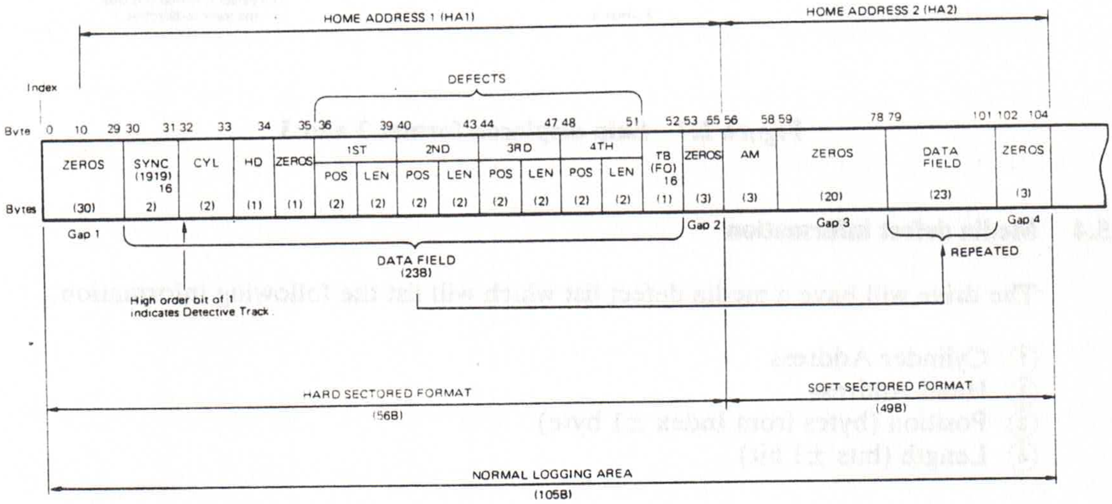
① Two to four defects
② Defective logging area

Note:

No track shall have more than four defects.

(2) Media defect free areas are defined as follows:

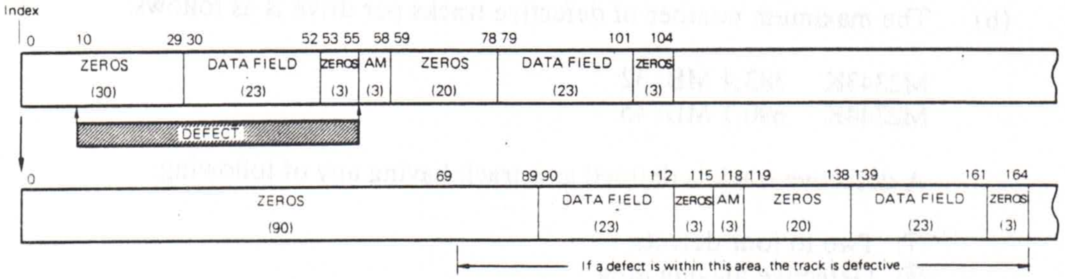
① Cylinder 0, Head 0 through 2
② Any error in logging area to extent defined in the Media Defect List



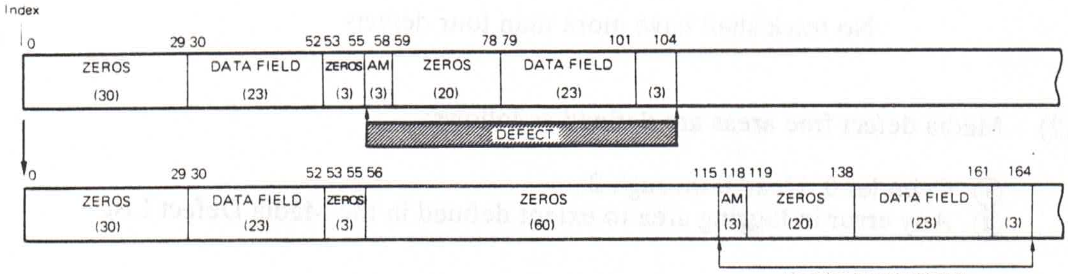
Notes:

1. Position (POS) of defect is in bytes after Index ±1 byte.
2. Length (LEN) of defect is in bits ±1 bit.
3. Unused defect locations are all zeros.

Figure 2.6 Media defect format 1



Format 2



Format 3

Figure 2.7 Skip displaced format 2 and 3

2.5.4 Media defect information

The drive will have a media defect list which will list the following information.

① Cylinder Address
② Head Address
③ Position (bytes from Index ±1 byte)
④ Length (bits ±1 bit)

The above information will be listed by hexadecimal code. The maximum media defect length at a defect is 64 bytes (512 bits).

2.5.5 Media defect format

The drive will be formatted at the factory with a standard Media Defect Format. The format consists of one part. The format is a hard-sectored format and is normally included in the first 56 bytes following Index signal, as shown in Figure 2.6 Format 1. The format rules are as follows:

① A track which has more than one defect is defined and flagged as a defective track. The first four media defects are logged.

② If the beginning of a defect is located between Byte 10 to Byte 55 (HA1) after Index, 60 bytes of zeros are added to gap 1 (90 bytes total). In this case, if any part of a defect is located between Byte 60 and Byte 115 (HA1), the track is flagged as defective. Refer to Figure 2.7 Format 2.

③ If the track is defined as a defective track according to above-mentioned Rules ① or ②, the high order bit of the first cylinder address byte is set to 1. Remaining information may or may not be valid.

CHAPTER 3 CONFIGURATION

Figure 3.1 shows the fundamental configuration of the drive; Figure 3.2 shows the block diagram.

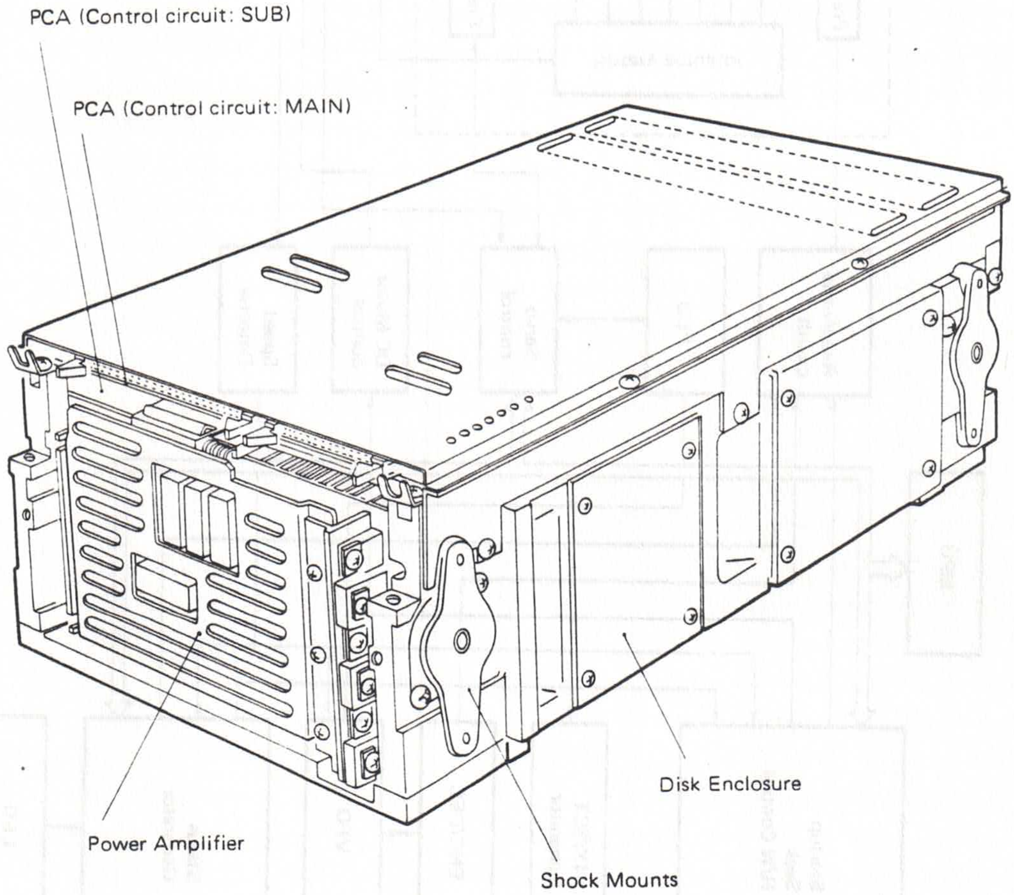


Figure 3.1 Fundamental configuration

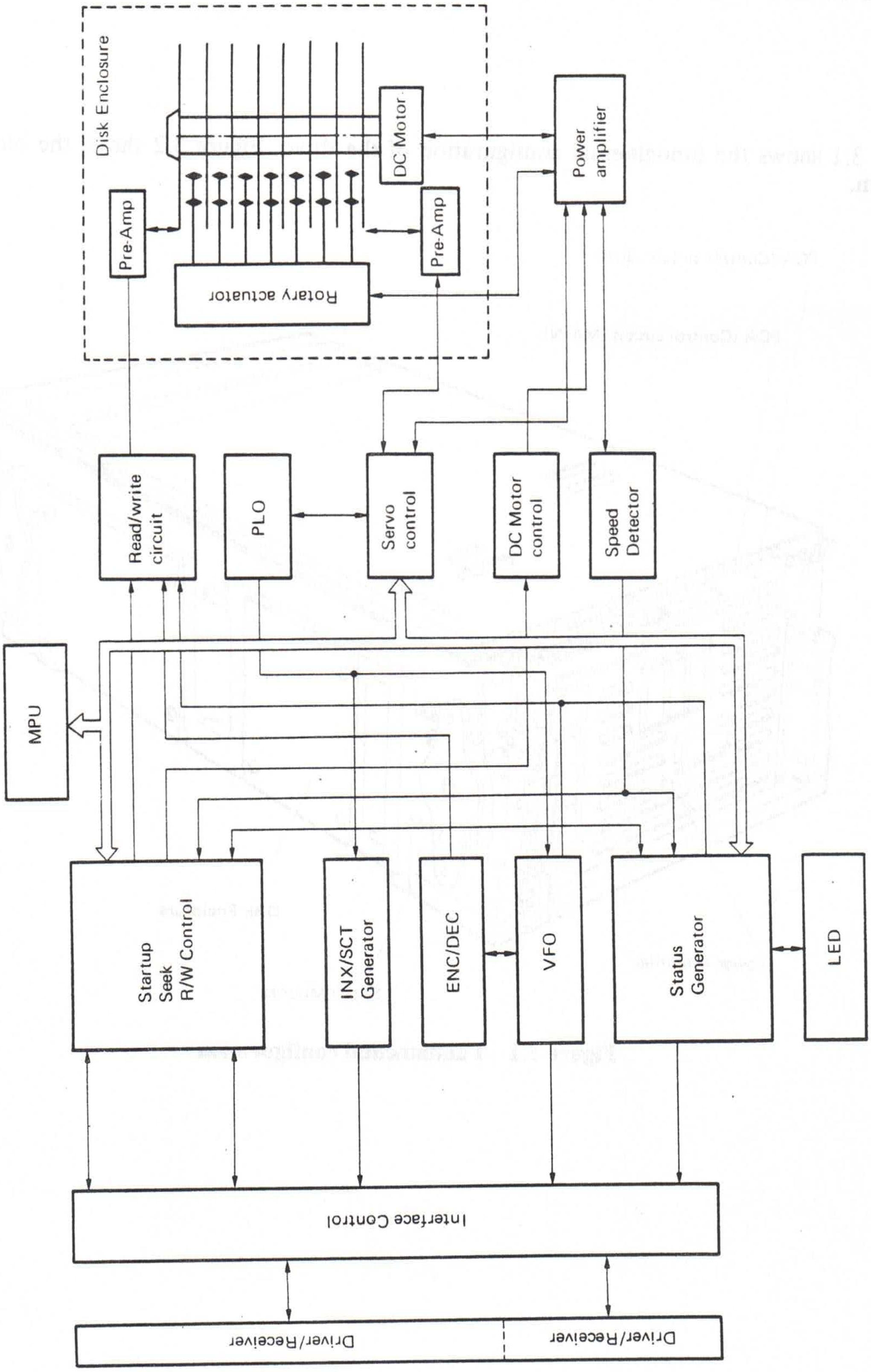


Figure 3.2 Block diagram

3.1 Major Components

(1) Disk enclosure

The Disk Enclosure is a completely sealed unit containing the disks, spindle, acturator, and heads. The DE is sealed at the factory and must not be opened in the field.

(2) Air circulation in DE

The breather filter, 99.97% efficient to 0.3 μm particles, is attached on the bottom side of DE. The air inlet through the filter opens adjacently to the spindle and this compensates for atmospheric changes priventing negative pressure in the vicinity of the spindle all the time while operating or not.

The recirculation filter allocated in the corner of DE to optimize the purge efficency is used to keep the air free from contaminants. The frame of this filter forms spoilers between the platters thus a simple air flow loop is obtained.

The conbination of these two filters allows extremely low flying height of heads keeping their reliability.

(3) Spindle drive motor

The spindle drive motor, an integral part of the spindle, is a 3-phase DC hall motor driven by +24 V. Both ends of the spindle shaft are supported on the rigid monocoque chassis through ferrofluidic seal bearings thus low susceptibility to external shocks/vibration and high pressure resistance are achieved.

(4) Actuator assembly

A rotary voice coil actuator is used for positioning data heads over a desired cylinder according to the servo information demodulated from servo head signal prerecorded at the factory.

The moving parts assembly is statically balanced and also supported on the monocoque chassis at both ends of pivot shaft. This provides the actuator with immunity to external shocks/vibration.

When the power is removed, the actuator lock is activated and heads are automatically retructed to the landing zone and latched.

(5) Printed circuit assemblies (PCAs)

The control circuit consists of three PCAs. Two, main/sub control circuit PCA, are secured by screws on the top of the disk enclosure and the other, plug-in type power amplifier, is mounted in the rear part. Basic functions are as follows:

① M-SMD interface control
② Drive status control
③ Read/Write control (encoder/decoder)
④ Head positioning servo control
⑤ Disk rotational speed control

3.2 Options

Table 3.1 Options (1/3)

Item No.	Component name	Specification (Part Number)	Remarks
1-1	Fan unit	B03B-4880-E001A	+24V DC, 0.5A 127 mm (H) standard
1-2	Fan unit	B03B-4880-E002A	+24V DC, 0.5A 154 mm (H) Drive with dual channel option (E402A)
2-1	Power supply unit	B14L-5105-0178A #A1	● for 1 drive ● 100/115/120/200/220/240 VAC ● With connectors for feeding power to fan units and dual channel option
2-2	Power supply unit	B14L-5105-0187A #A1	● for 2 drives ● 100/115/120/1200/220/240 VAC ● With connectors for feeding power to fan units and dual dual channel option
3-1	Cable (Non-shielded)	B660-1065-T006A	Interface cable (A) 60P flat cable
3-2	Cable (Non-shielded)	B660-1065-T008A	Interface cable (B) 26P flat cable
3-3	Cable (Non-shielded)	B660-1865-T020A	Interface cable (A) for 2 drives daisy chain
3-4	Cable (Non-shielded)	B660-1865-T030A	Interface cable (A) for 3 drives daisy chain
3-5	Cable (Non-shielded)	B660-1865-T040A	Interface cable (A) for 4 drives daisy chain
3-6	Cable (Non-shielded)	B660-1865-T050A	Interface cable (A) for 5 drives daisy chain
3-7	Cable (Non-shielded)	B660-1865-T060A	Interface cable (A) for 6 drives daisy chain
3-8	Cable (Non-shielded)	B660-1865-T070A	Interface cable (A) for 7 drives daisy chain
3-9	Cable (Non-shielded)	B660-1865-T080A	Interface cable (A) for 8 drives daisy chain
3-10	Cable (Shielded)	B660-0620-T438A	interface cable (A) 60P flat cable
3-11	Cable (Shielded)	B660-0620-T436A	Interface cable (B) 26P flat cable
3-12	Cable (Shielded)	B660-0620 T439A	Interfac cab;e (A) fpr 2 drives daisy chain
3-13	Cable (Shielded)	B660-0620-T440A	Interface cable (A) for 3 drives daisy chain

Table 3.1 Options (2/3)

Item No.	Component name	Specification (Part Number)	Remarks
3-14	Cable (Shielded)	B660-0620-T441A	Interface cable (A) for 4 drives daisy chain
3-15	Cable (Shielded)	B660-0620-T442A	Interface cable (A) for 5 drives daisy chain
3-16	Cable (Shielded)	B660-0620-T443A	Interface cable (A) for 6 drives daisy chain
3-17	Cable (Shielded)	B660-0620-T444A	Interface cable (A) for 7 drives daisy chain
3-18	Cable (Shielded)	B660-0620-T445A	Interface cable (A) for for 8 drives daisy chain
4-1	Panel unit	B03B-4880-E501A	Flat key type control panel board
4-2	Diagnostic panel	B03B-4880-E550A	Maintenance panel ● Seek exerciser/bus status monitor/error logging monitor
5-1	Mounting tray	B21L-1810-0001A	For mounting two drive in 19-inch rack with 3 pitches (tray and side guide)
5-2	Mounting tray	B21L-1810-0002A	For mounting two drives in 19-inch rack with 3 pitches with Optional panel unit
5-3	Mounting tray	B21L-1810-0003A	For mounting two drive in 19-inch rack with 4 pitches (tray and slide guide)
5-4	Mounting tray	B21L-1810-0004A	For mounting two drives in 19-inch rack with 4 pitches with optional panel unit
6-1	Dual channel	B03B-4760-E401A	To be mounted on the optional PSU (B14L-5105-0178A#A2)
6-2	Dual channel	B03B-4760-E407A	To be mounted on the optional PSU (B14L-5105-0187A#A1)
6-3	Channel rail	B03B-4740-E408A	Brackets for mounting dual channel option (B03B-4760-E407A) on the optional PSU (B14L-5105-0187A#A1)
6-4	Dual channel	B03B-4880-E402A	To be mounted on the Drive
7-1	Power cable (Non-Shielded)	B660-0625-T327A	Drive-optional power supply

Table 3.1 Options (3/3)

Item No.	Component name	Specification (Part Number)	Remarks
7-2	Power cable (Non-shielded)	B660-0625-T449A	Drive and DC (+24) Fan unit-optional power supply
7-3	Power cable (Shielded)	B660-0620-T446A	Drive-optional power supply
7-4	(Power cable) (Shielded)	B660-0620-T448A	Drive and DC (+24) Fan unit-optional power supply
8-1	Cable	B660-1995-T003A	Optional panel unit (B03B-4880-E501A)-drive.
8-2	Cable	B660-2560-T004A	Diagnosis panel option (B03B-4880-E550A)-drive
9-1	Cable (Non-shielded)	B660-0625-T329A	Dual channel option-optional power supply
9-2	Cable (Shielded)	B660-0620-T450A	Dual channel option-optional power supply

Note:

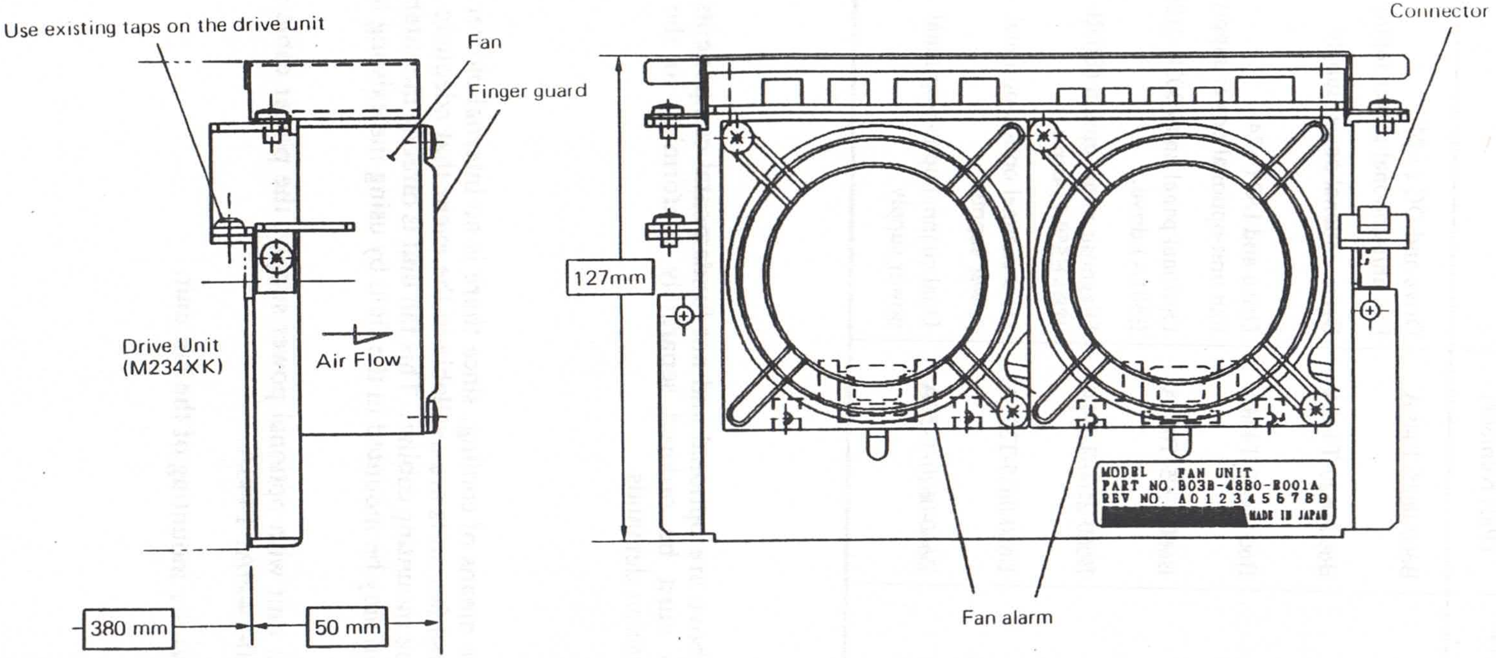
Items in the table above are optional and not fundamental components of this drive. These items must be ordered separately conforming to the above specifications as occasion demands.

3.2.1 Fan unit

This drive requires some means of cooling, since there is no internal blower motor. For this purpose, optional fan units are available in the event that adequate cooling is not provided within the mounting cabinet. This fan unit is directly mountable onto the rear of the drive, and may be mounted in the field by using the existing taps and attached screws.

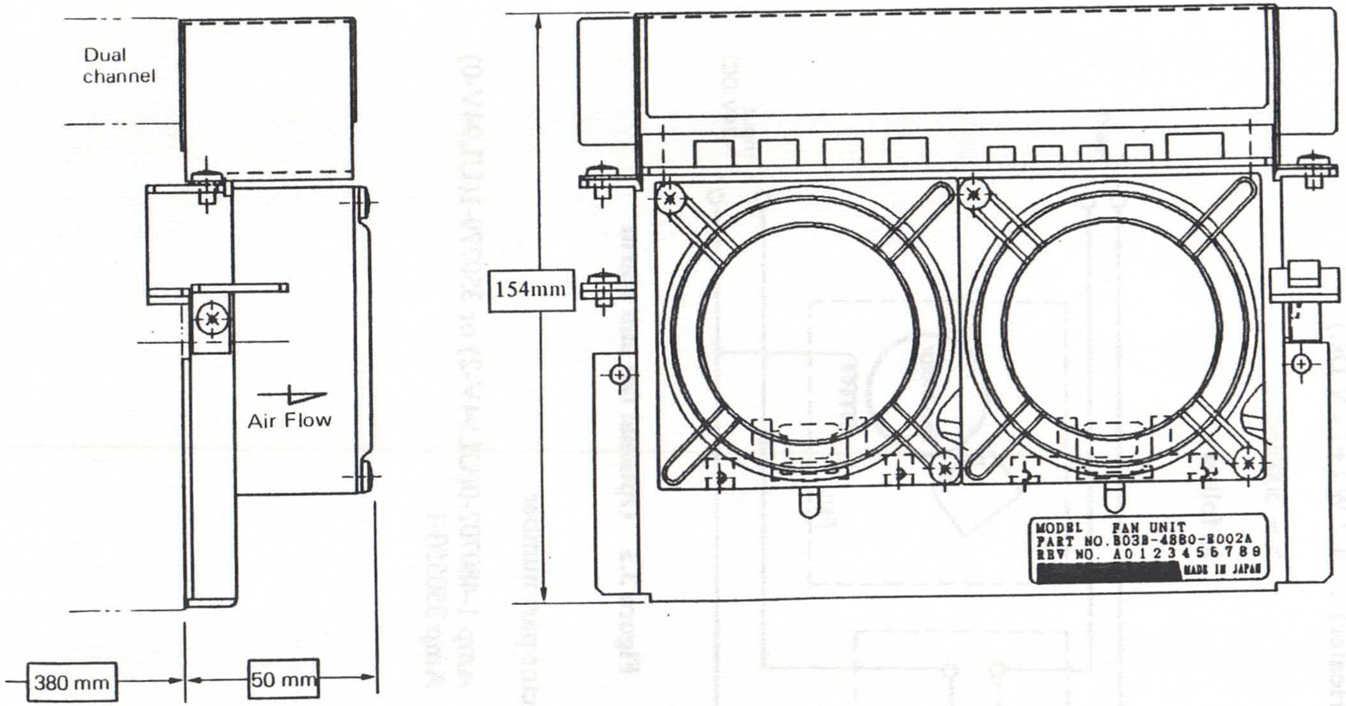
In the case of using fun unit with optional power supply, the power cable shall be designated as B660-0620-T449A, T448A.

Figure 3.3 and 3.4 shows the mounting of the fan unit.



Pin No.	
1	+24V DC
2	+24V Return
3	ALARM (*2)
4	ALARM (*2)

Figure 3.3 Fan unit: B03B-4880-E001A



Pin No.	
1	+24V DC
2	+24V Return
3	ALARM (*2)
4	ALARM (*2)

Figure 3.4 Fan unit: B03B-4880-E002A

*2: Fan alarm specification

Type of contact point : Normal open

Contact capacity : 0.5 A DC Max.
200 V DC Max.
*However: i(A) × E(V) ≦ 10 W DC

Rated power (Heater) : 4.2 W (+24 V DC)

Response time : 5 – 300 sec.

Circuit : as follows

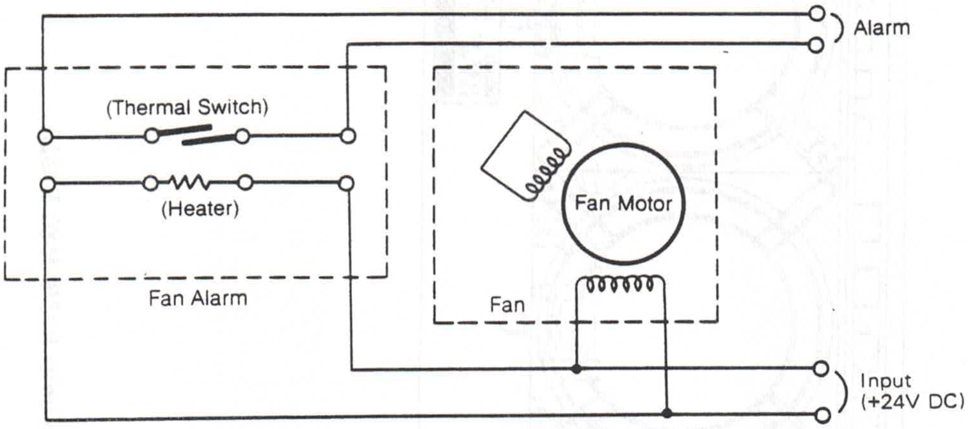


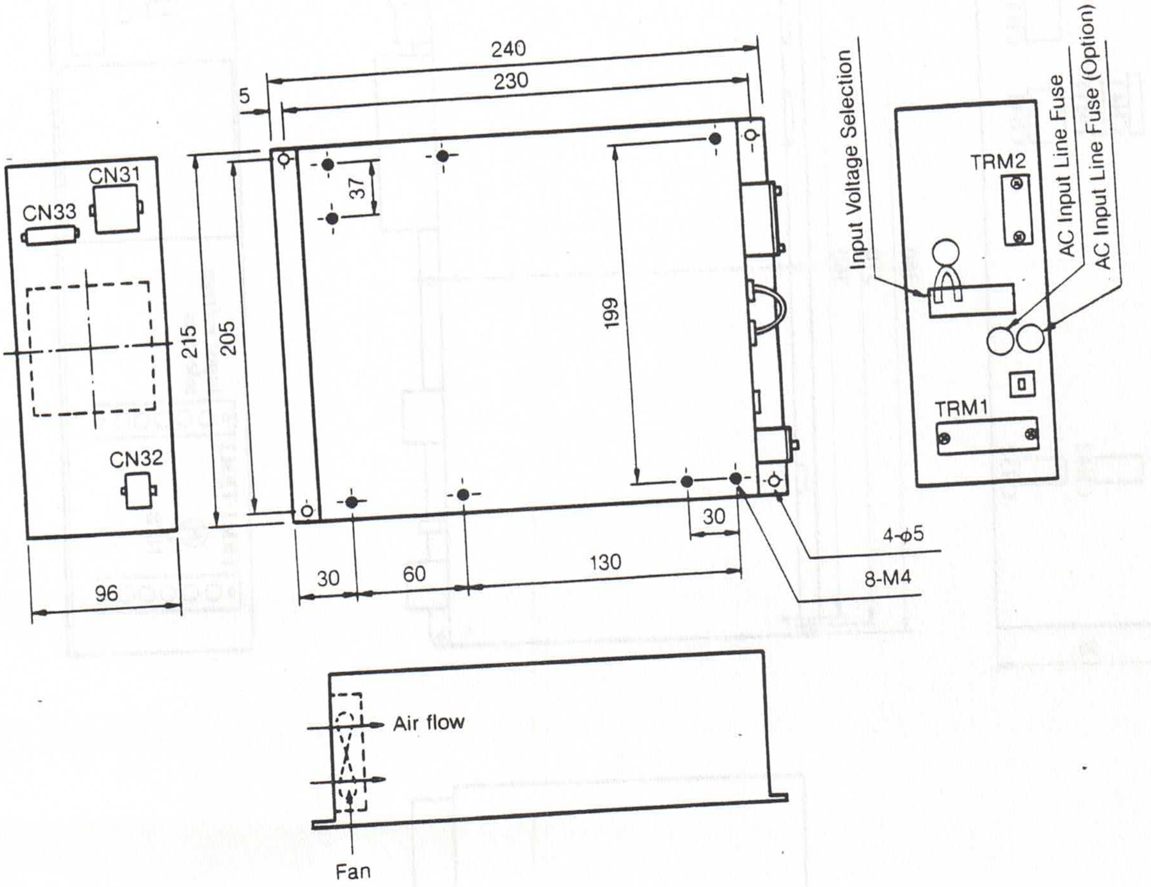
Figure 3.5 Optional fan unit alarm

*3: Fan unit connector part number

Connector : Amp 1-480702-0(UL94V-2) or 350779-1(UL94V-0)
Contact : Amp 350550-1

3.2.2 Power supply unit

A power supply unit may either be mounted horizontally behind the drive or may be mounted vertically. Figures 3.6 and 3.7 show the details of I/O terminals and the external dimensions of the power supply units.



TRM1 : AC power input and alarm sending

TRM2 : FG-SG couplind terminal (Normally open)

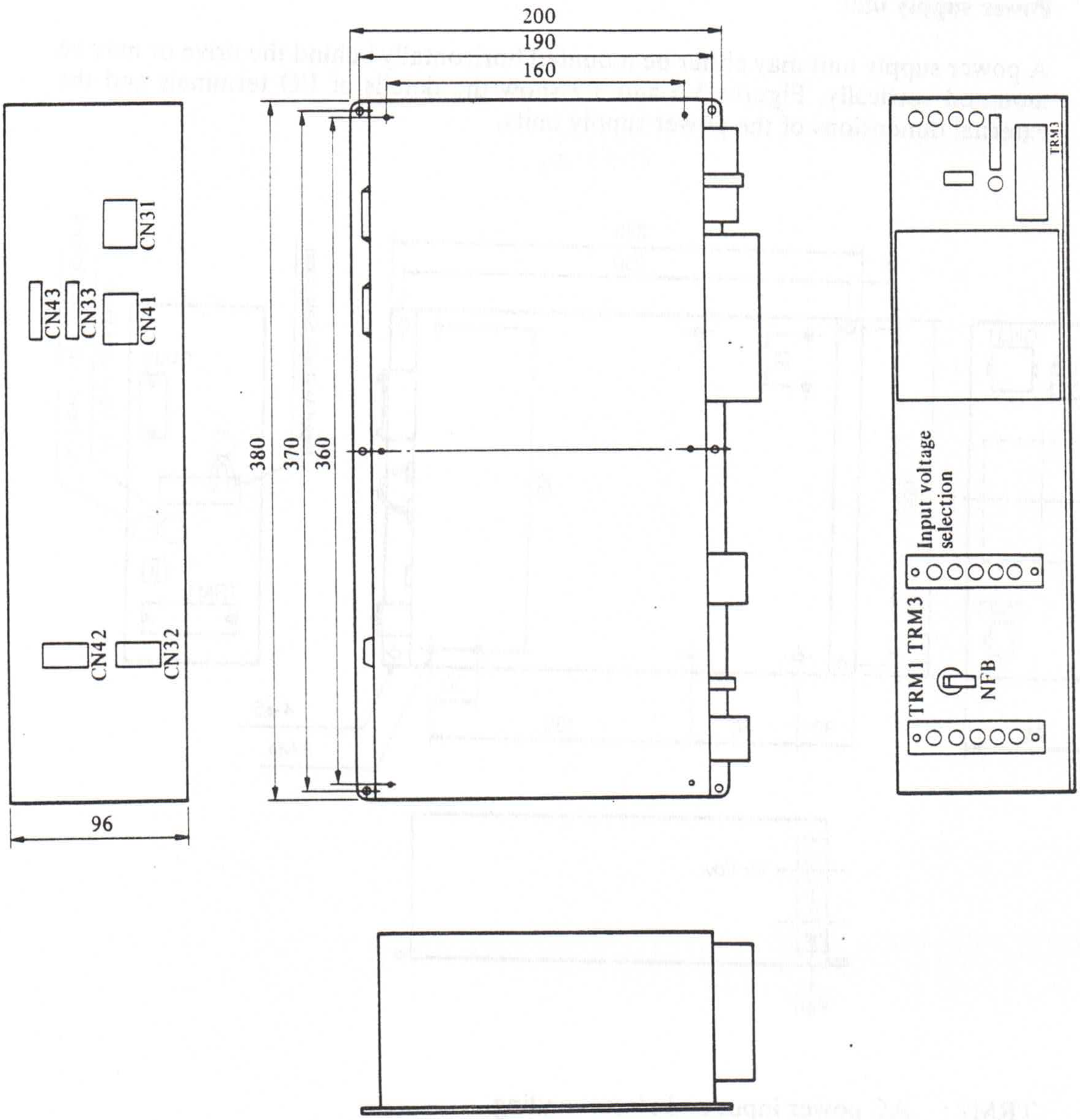
CN31 : Drive unit power feeding connector

CN32 : Device Alarm feeding connector for cable B660-1995-T041A (Option)

CN33 : Dual channel option power feeding connector for cable B660-0625-T329A (option)

AC input voltage selection from 100/115/120V AC to 220/240 V AC is selectable. (Terminal connection)

Figure 3.6 Power supply unit: B14L-5105-0178A#A2



TRM1 : AC power input and alarm sending

TRM2 : FG-SG coupling terminal (Normally open)

CN31, CN41 : Device unit power feeding connector

CN32, CN42 : Device Alarm feeding connector for cable B660-1995-T041A (Option)

CN33, CN43 : Dual channel option power feeding connector for cable B660-1995-T060A (Option)

AC Input voltage selection from 100/115/120 VAC to 200/220/240 VAC is selectable. (Terminal connection)

Figure 3.7 Power supply unit: B14L-5105-0187A#A1

3.2.3 19-inch rack mount kit

A mounting tray and brackets are available to facilitate the installation of two drives, side by side in a 19-inch rack, in three or four pitches. The tray can also accommodate the optional fan unit and power supply unit(s) for each of the two drives.

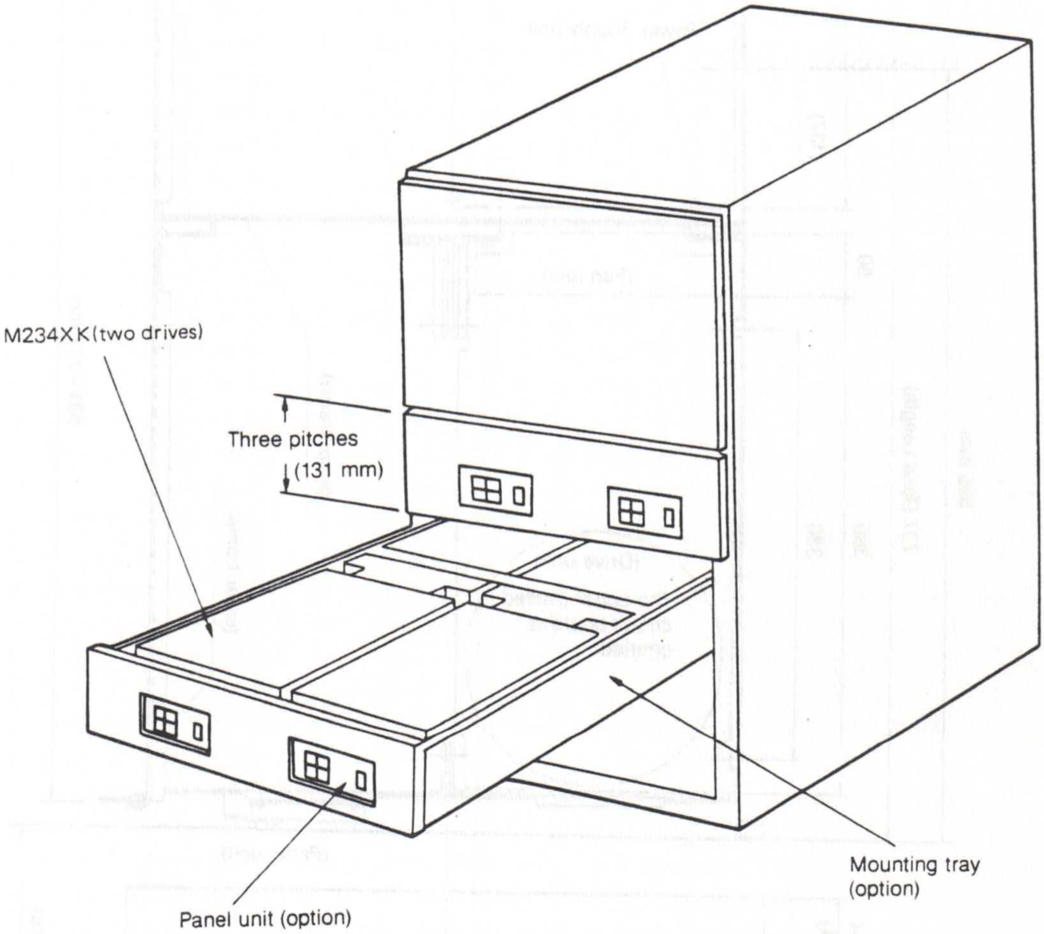
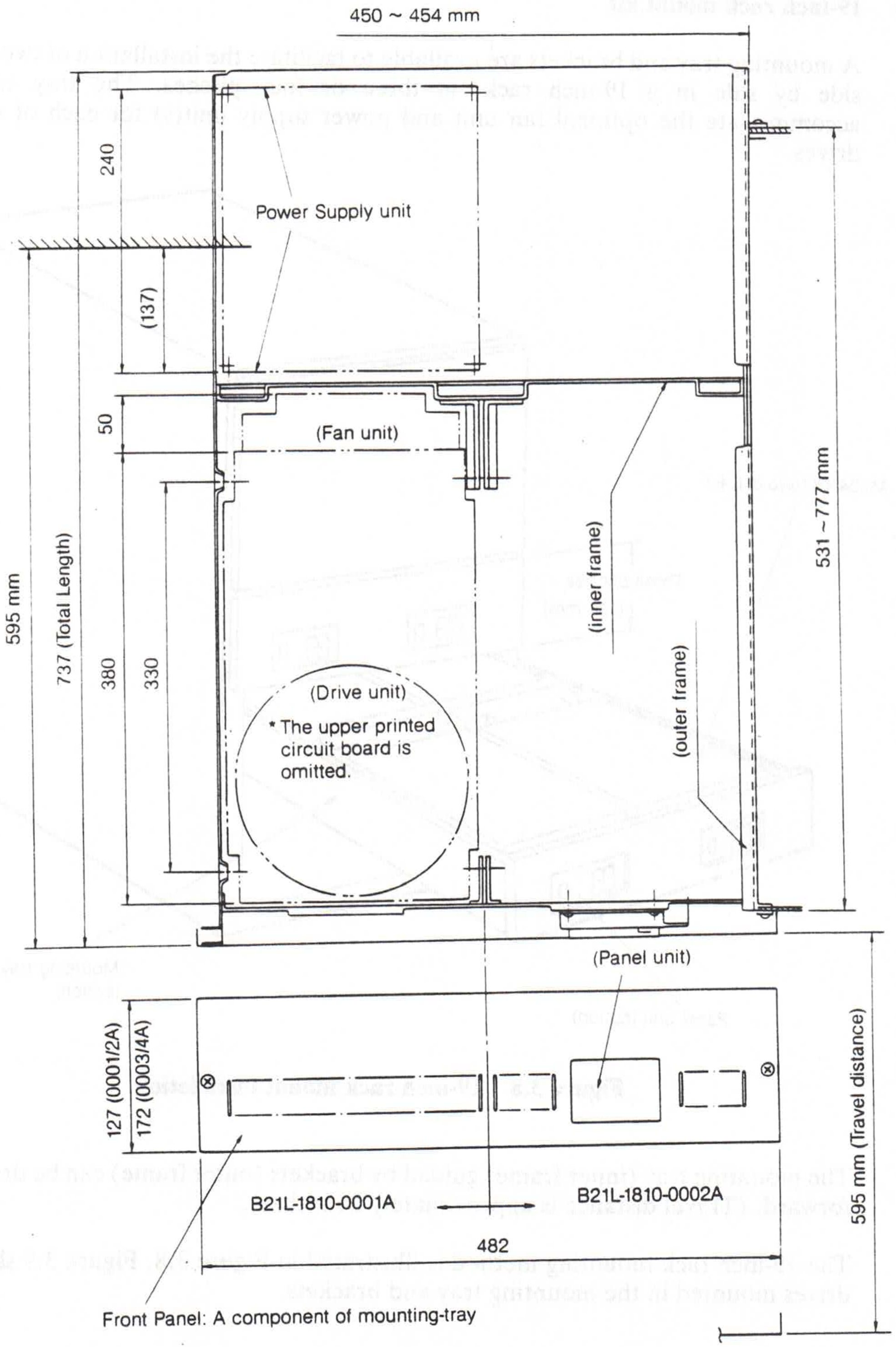


Figure 3.8 19-inch rack mount installation

The mounting tray (inner frame) guided by brackets (outer frame) can be drawin out forward. (Travel distance is approximately 24 inches).

The 19-inch rack mounting method is illustrated in Figure 3.8. Figure 3.9 shows the drives mounted in the mounting tray and brackets.



Note:

Mounting tray (0001A) cannot accommodate the optional panel unit; In that case, 0002A-type must be specified.

Figure 3.9 Mounting tray

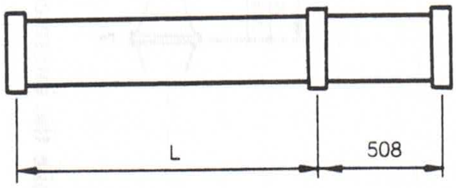
3.2.4 Cables

The interface cable (A) may be up to 30 m long (to the drive at the final step in case of daisy-chain mode). The length of the cable can be specified in 20 inches (508 mm) increments.

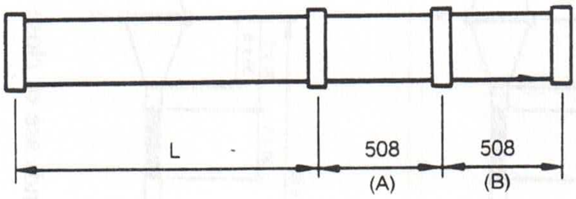
The interface cable (B) may be up to 15 m long. The length of this cable can be specified in 500 mm increment.

The (A) cables for daisy-chain connection shown at items 3-3 to 3-9 and 3-12 to 3-18 in Table 3.1 are as shown in Figures 3.10 and 3.11. Cable length "L" (specifiable by "#L") refers to the corresponding sections of the following drawings:

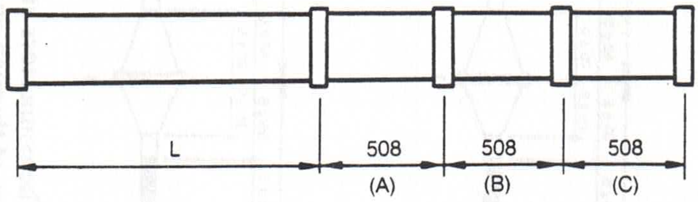
- For B660-1865-T020A



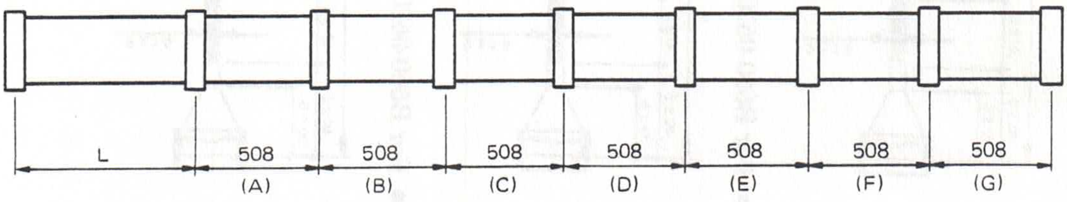
- For B660-1865-T030A



- For B660-1865-T040A



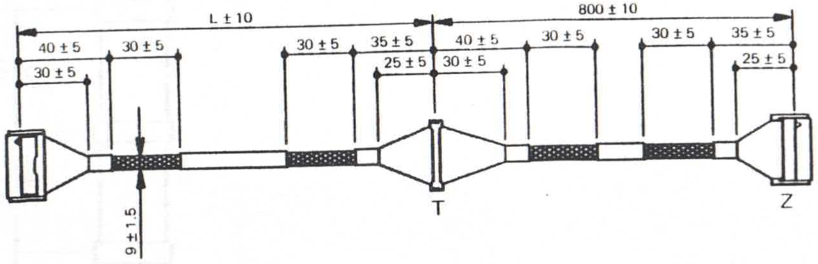
- For B660-1865-T080A



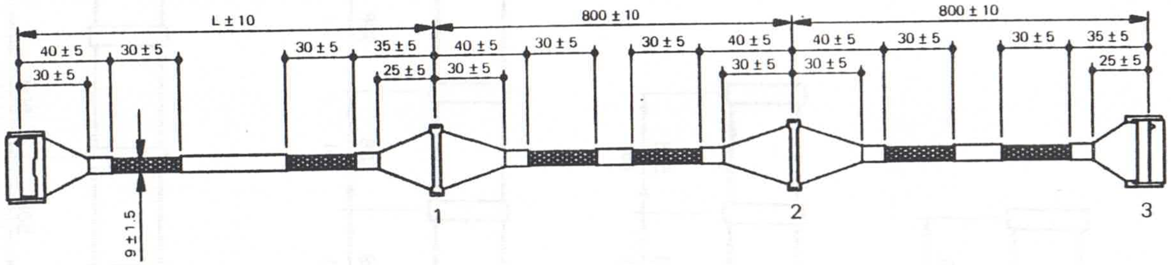
* The connectors at both ends are of close-end, while the intermediate connectors are of through-end.

Figure 3.10 A-cables for daisy-chain (non-shield type)

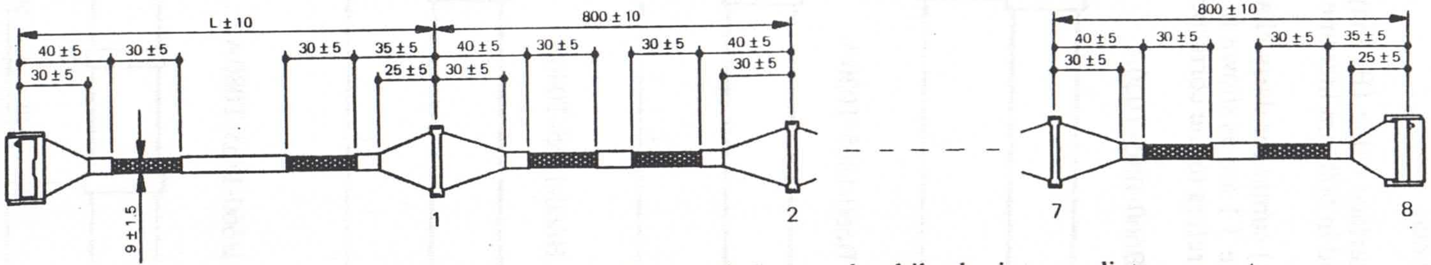
- For B660-0620-T439A



- For B660-0620-T440A



- For B660-0620-T445A



* The connectors at both ends are of close-end, while the intermediate connectors are of through-end.

Figure 3.11 A-cable for daisy-chain (shield type)

How to specify cable lengths

(For 3.5 m: Example 1)

B660-1065-T008A	#L3R503
Cable specification	3.5×10^3 (mm)

(For 50 cm: Example 2)

B660-0625-T327A	#L500R0
Cable specification	500×10^0 (mm)

The lengths of cables at Items 7, 8 and 9 in Table 3.1 must also be specified.

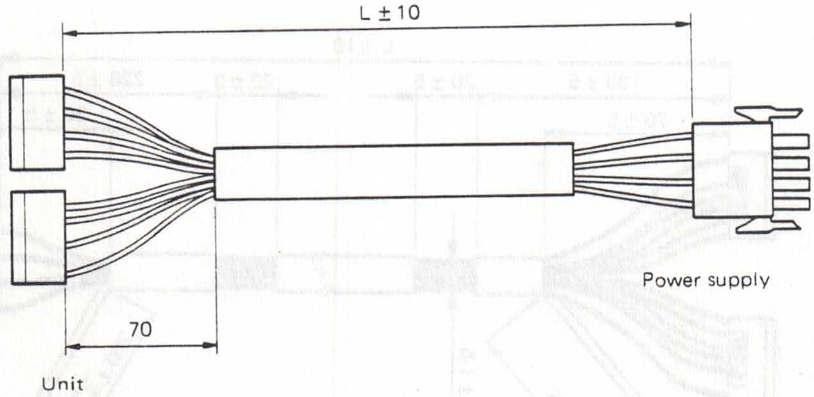


Figure 3.12 Power cable: B660-0625-T327A

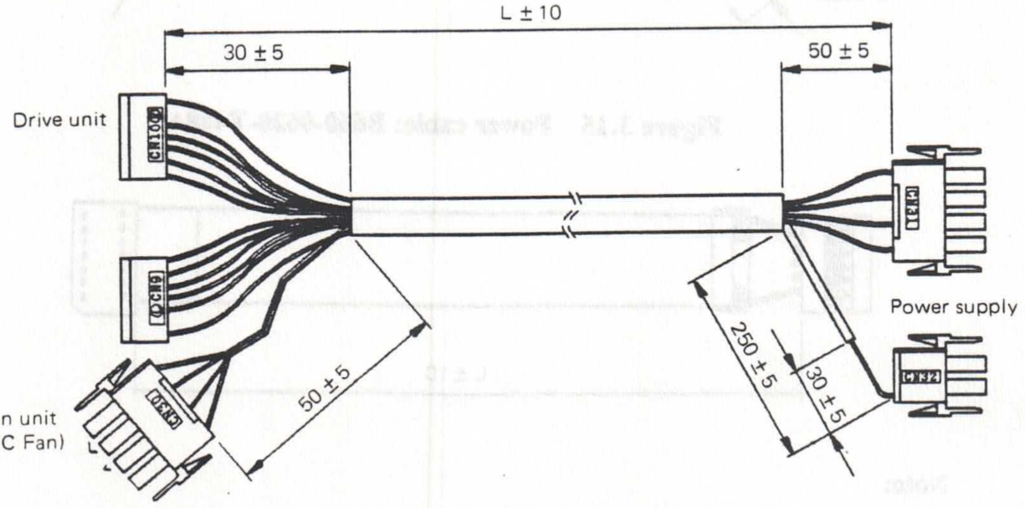


Figure 3.13 Power cable: B660-0625-T449A

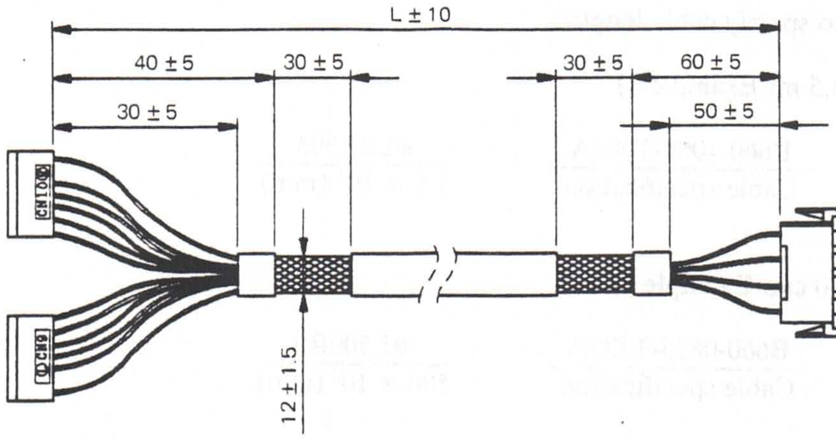


Figure 3.14 Power cable: B660-0620-T446A

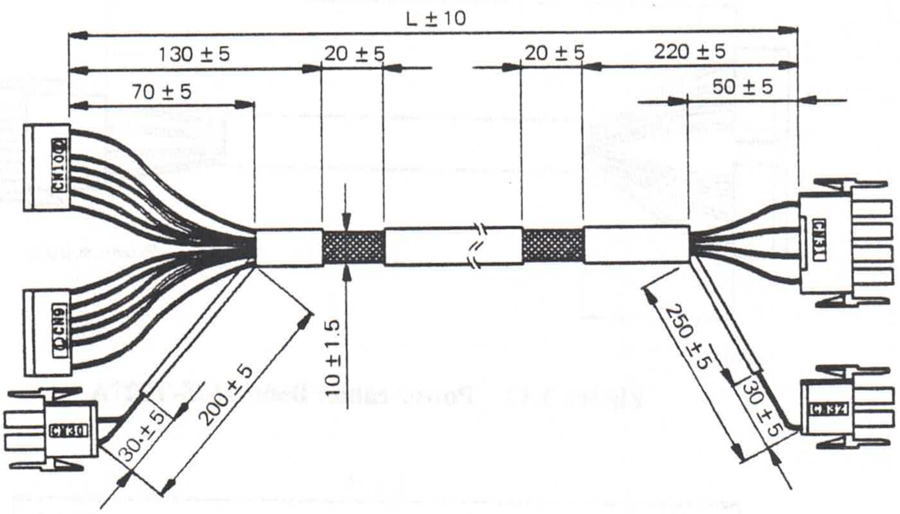
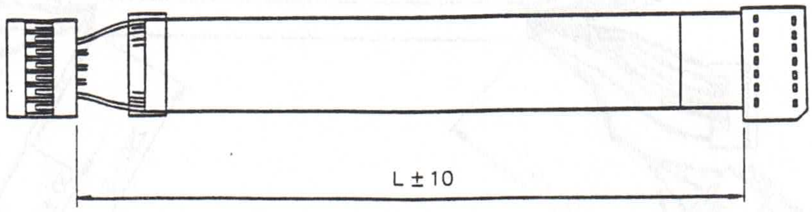


Figure 3.15 Power cable: B660-0620-T448A



Note:

The Length of this cable can be specified in 60 mm increment. (Minimum length is 90 mm.)

Figure 3.16 Cable: B660-1995-T003A
(E501A Panel unit-Drive connecting)

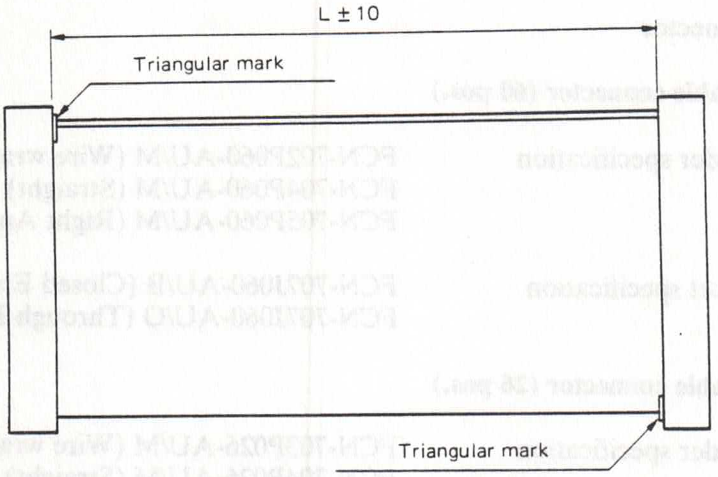


Figure 3.17 Cable: B660-2560-T004A
(Diagnostic panel-drive)

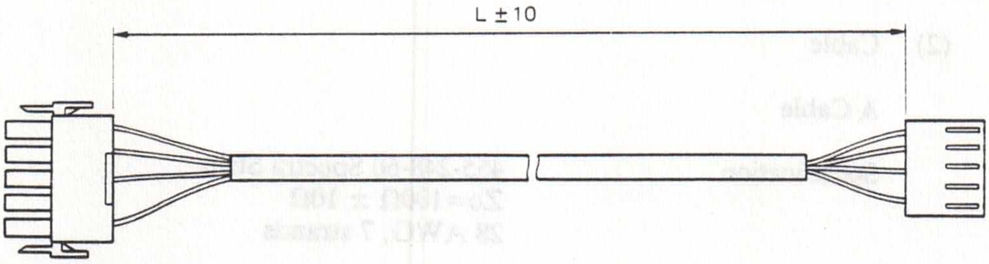


Figure 3.18 Cable: B660-0625-T329A
(Dual channel PCA-power supply unit)

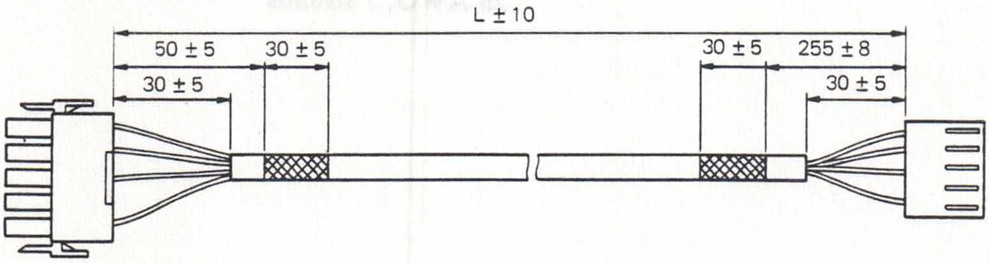


Figure 3.19 Cable: B660-0620-T450A
(Dual channel PCA-power supply unit)

(1) Connector

A Cable connector (60 pos.)

Header specification	FCN-702P060-AU/M (Wire wrapping) FCN-704P060-AU/M (Straight) FCN-705P060-AU/M (Right Angle)
Socket specification	FCN-707J060-AU/B (Closed End) FCN-707J060-AU/O (Through End)

B Cable connector (26 pos.)

Header specification	FCN-703P026-AU/M (Wire wrapping) FCN-704P026-AU/M (Straight) FCN-705P026-AU/M (Right Angle)
Socket specification	FCN-707J026-AU/B (Closed End) FCN-707J026-AU/O (Through End)

(2) Cable

A Cable

Specification	455-248-60 Spectra Strip Zo=100Ω ± 10Ω 28 AWG, 7 strands

B Cable

Specification	174-26 Ansley/3476-26 3M Zo=100Ω ± 10Ω/Zo=130Ω ± 15Ω 28 AWG, 7 strands

3.2.5 Panel unit

The optional panel unit includes function lights which indicate power on, ready, write protect, check, and a write protect and check clear switches.

Figure 3.20 shows the mounting dimensions and mounting status of panel unit B03B-4880-E501A. This panel unit will mount directly on the drive.

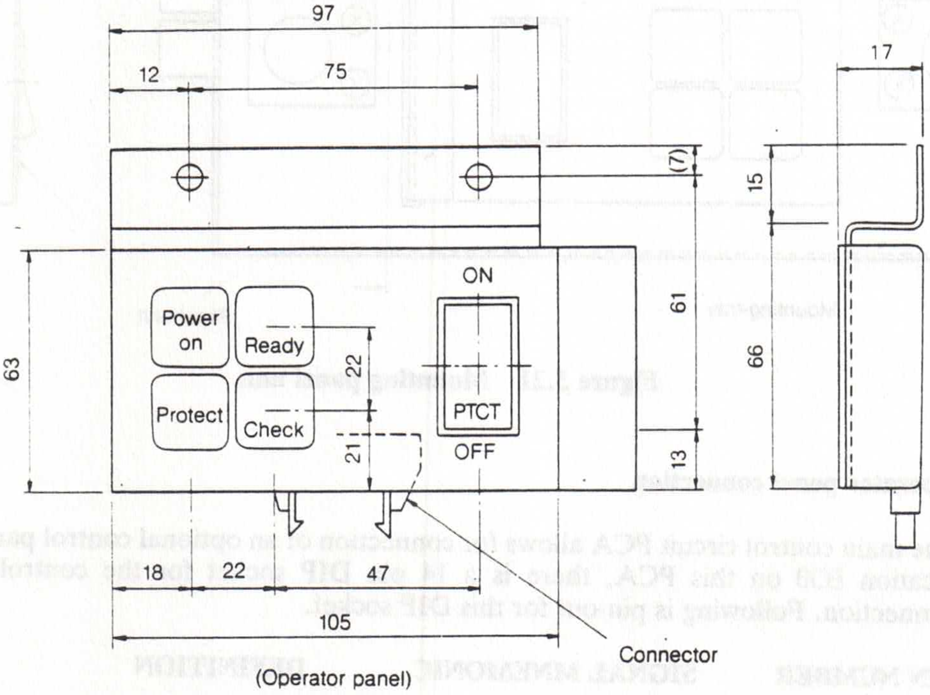


Figure 3.20 Panel unit: B03B-4880-E501A

When the panel unit is used with the mounting tray (B21L-1810-0002A), this panel unit (B03B-4880-E501A) is mounted as shown in Figure 3.21.

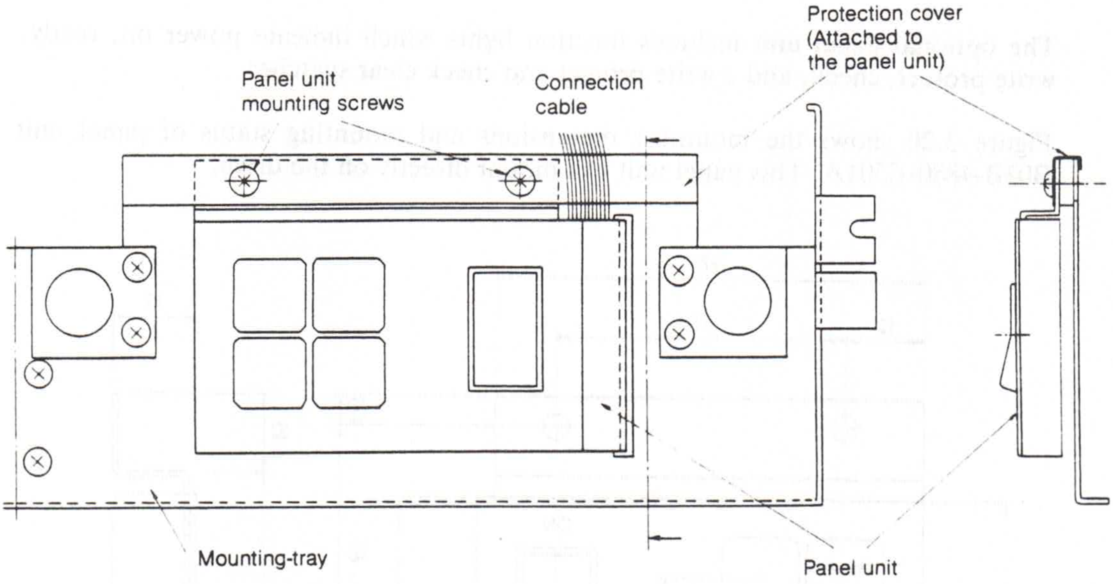


Figure 3.21 Mounting panel unit

Operator panel connection

The main control circuit PCA allows for connection of an optional control panel. At location B30 on this PCA, there is a 14 pin DIP socket for the control panel connection. Following is pin-out for this DIP socket.

PIN NUMBER	SIGNAL MNEMONIC	DEFINITION
1	+5 V	+5 Volt
2	*FPTK	File Protect Switch
3	*CKCLR	Check Clear Switch
4	*LRDY	Ready LED
5	OV	Signal Ground
6	*LUSLD	Unit Selected LED
7	OV	Signal Ground
8	OV	Signal Ground
9	*PWRDY	Power Ready LED
10	*LFPT	File Protect LED
11	*LDVCK	Device Check LED
12	OV	Signal Ground
13	OV	Signal Ground
14	+5 V	+5 Volt

"*" indicates a low active signal.

3.2.6 Diagnostic panel unit

The optional diagnostic panel is available for maintenance facility or other purpose. The dimensions are given in Figure 3.22.

For detailed description of functions, refer to CE Manual.

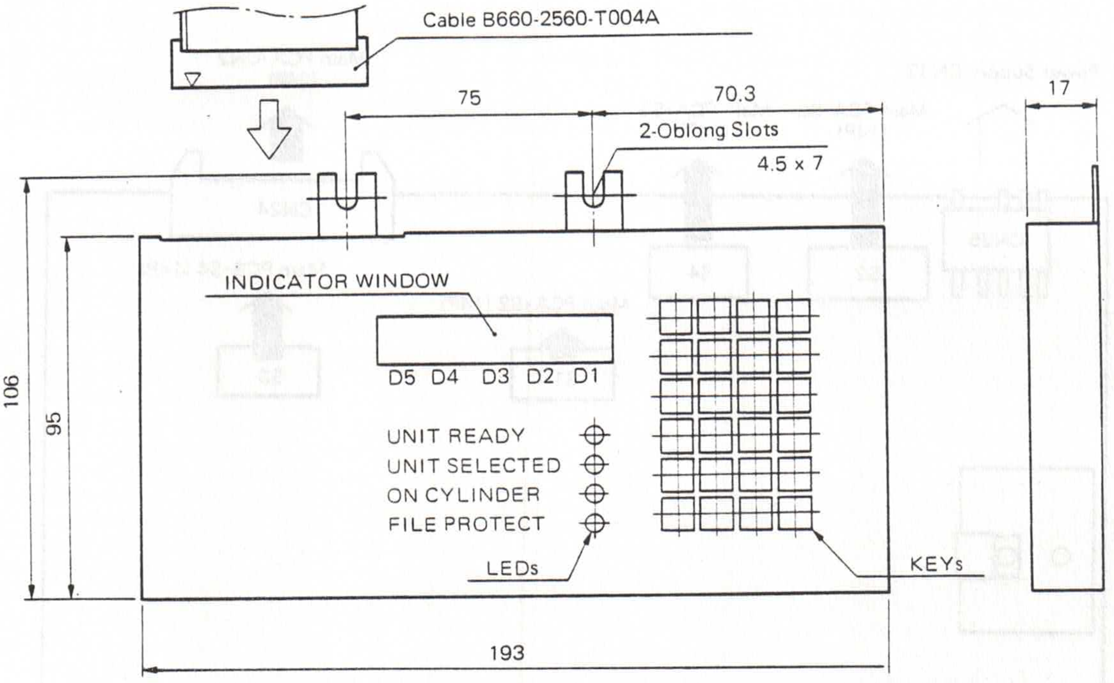


Figure 3.22 Diagnostic panel unit

3.2.7 Dual channel option

The drive may be provided with three types of dual channel option which differ in their brackets according to their mounting location.

The PCA which adds cross-call function is common to these options, rated +5 V, 1A and −12 V, 0.5A. Connector location on the PCA and cable connection are shown in Figure 3.23

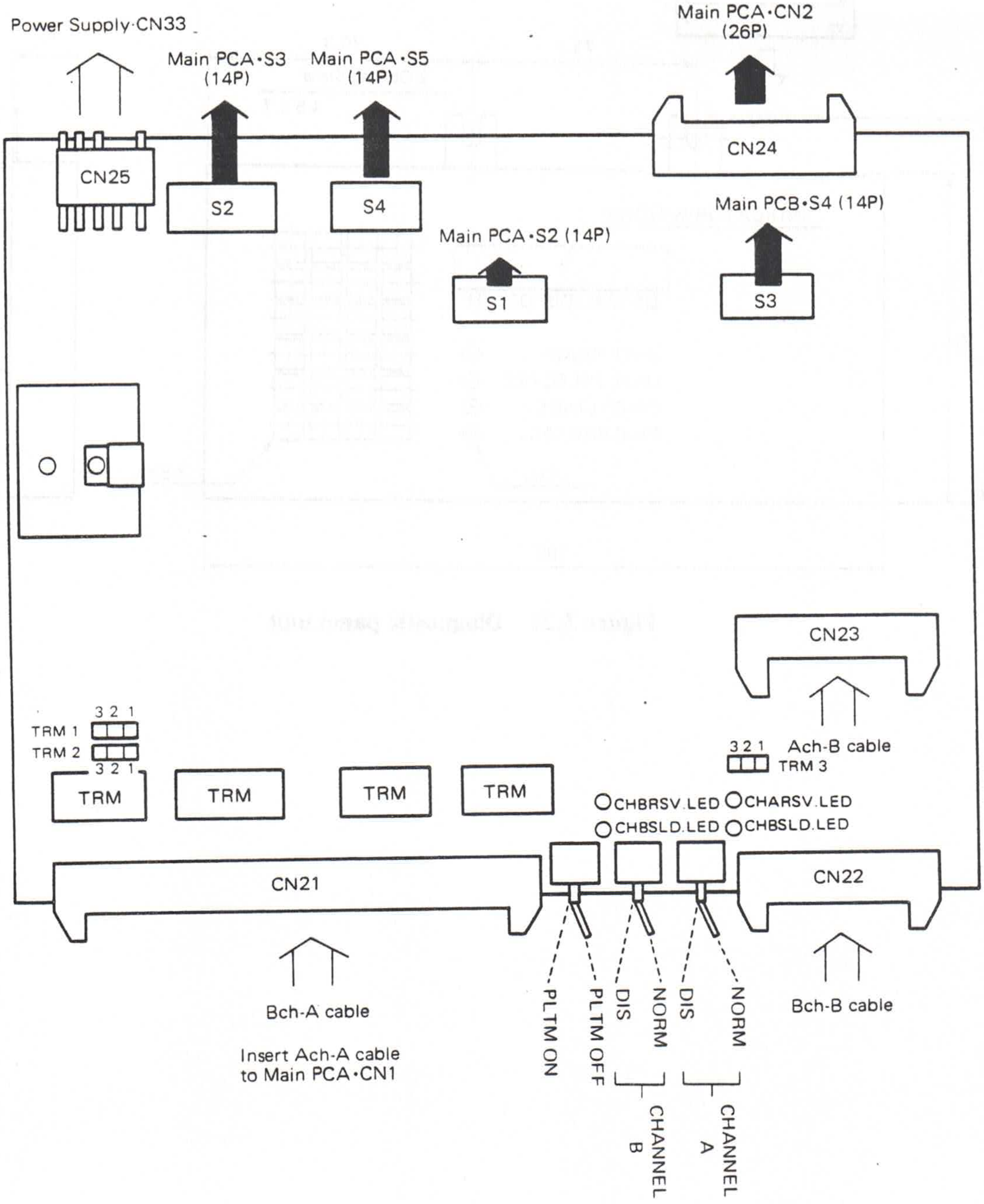


Figure 3.23 Dual channel PCA connector location

Dimensions of the options after installation are shown in Figures 3.24, 3.25 and 3.26.

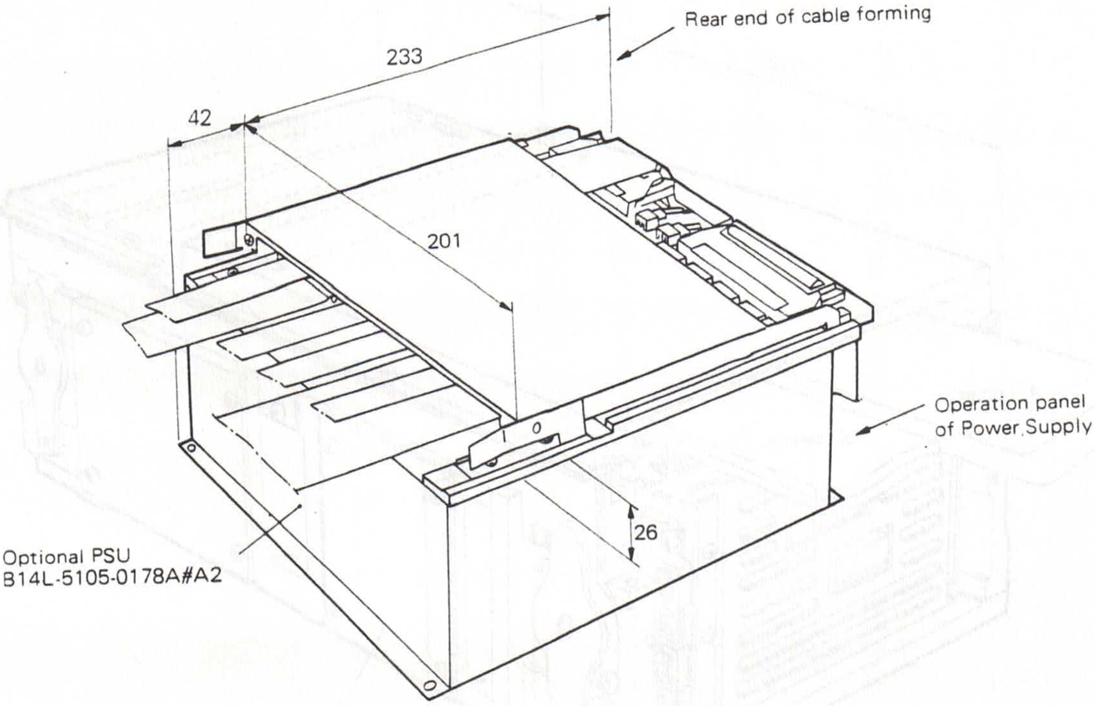


Figure 3.24 Dual channel (B03B-4760-E401A)

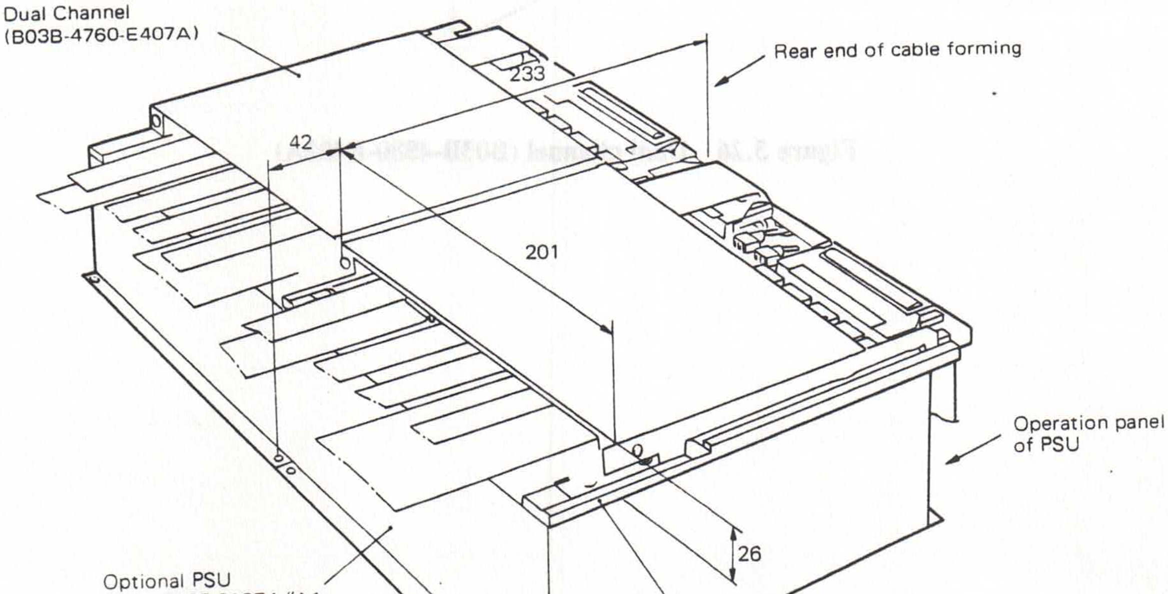


Figure 3.25 Dual channel (B03B-4760-E407A) and channel rail (B03B-4760-E408A)

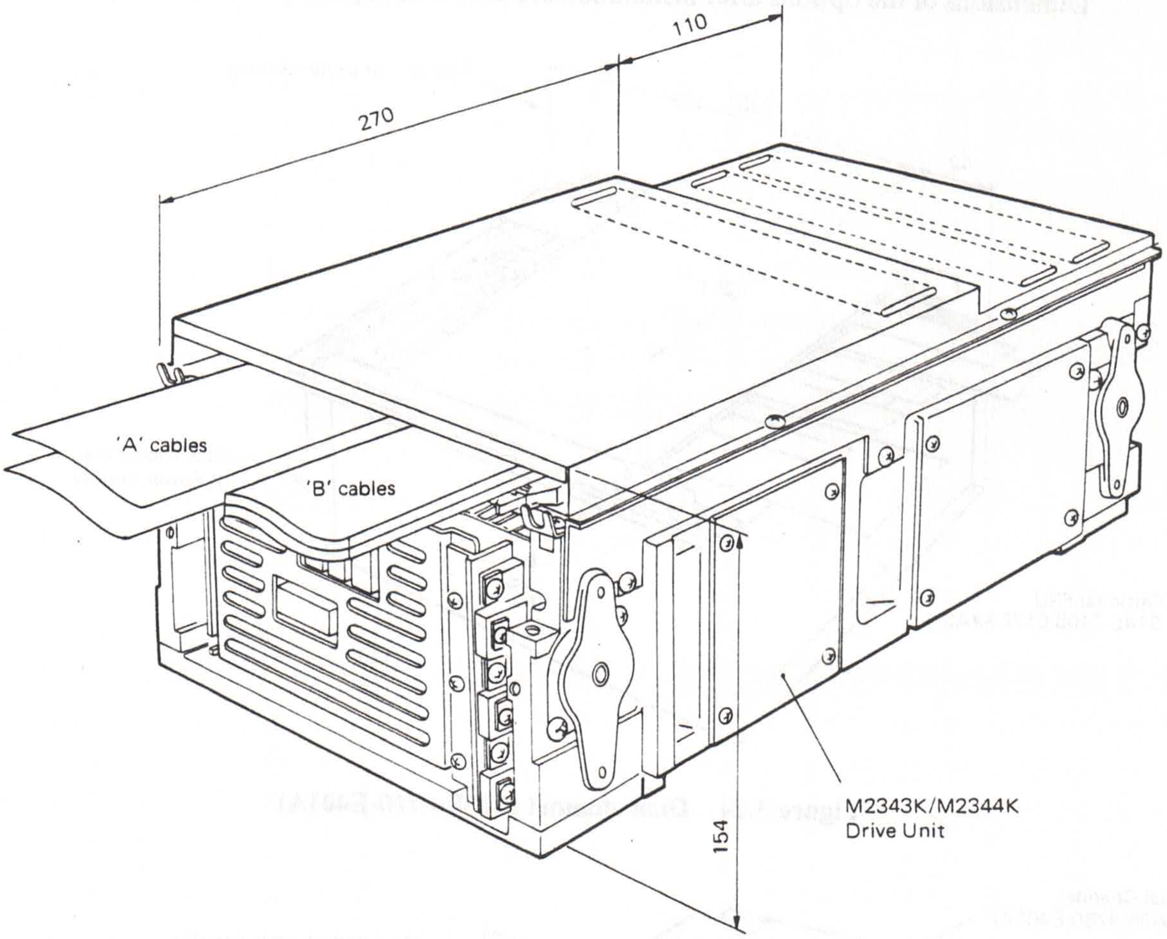
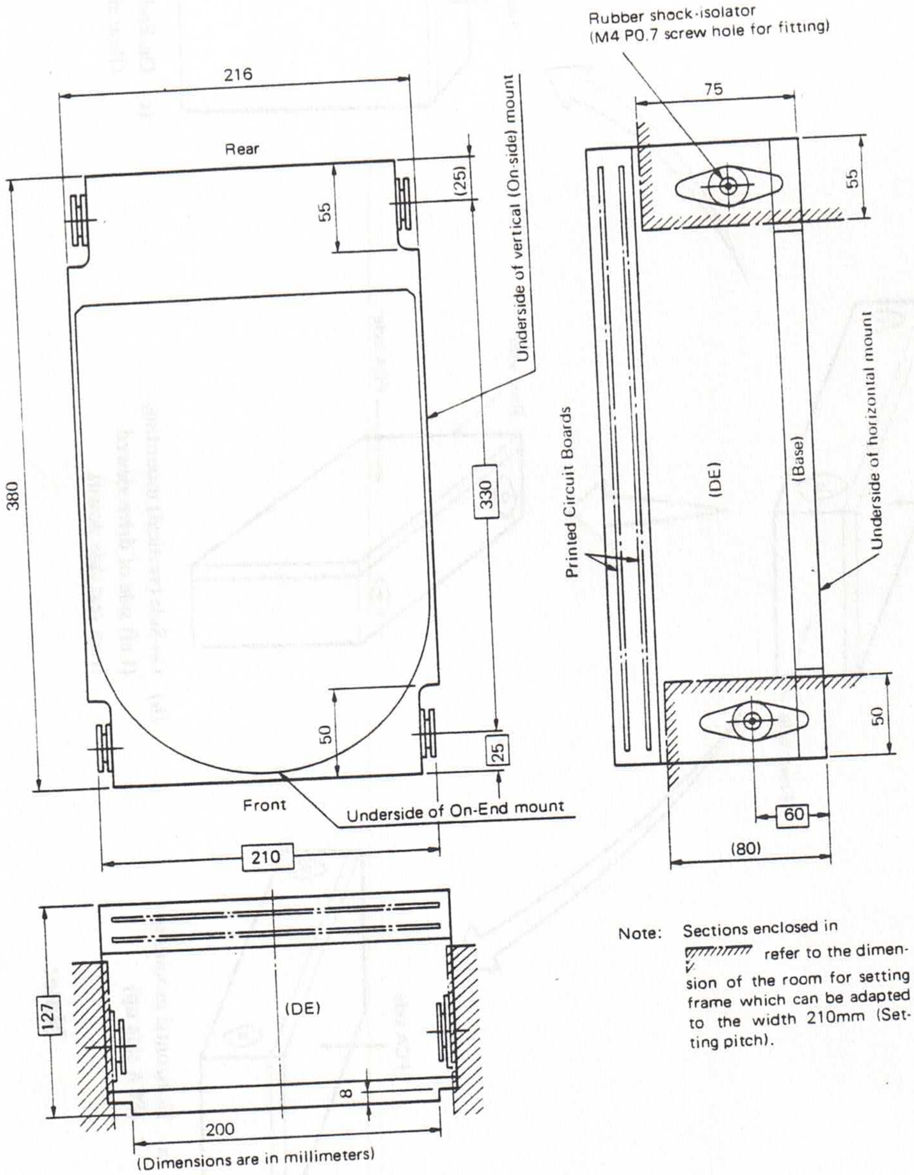


Figure 3.26 Dual channel (B03B-4880-E402A)

CHAPTER 4 INSTALLATION

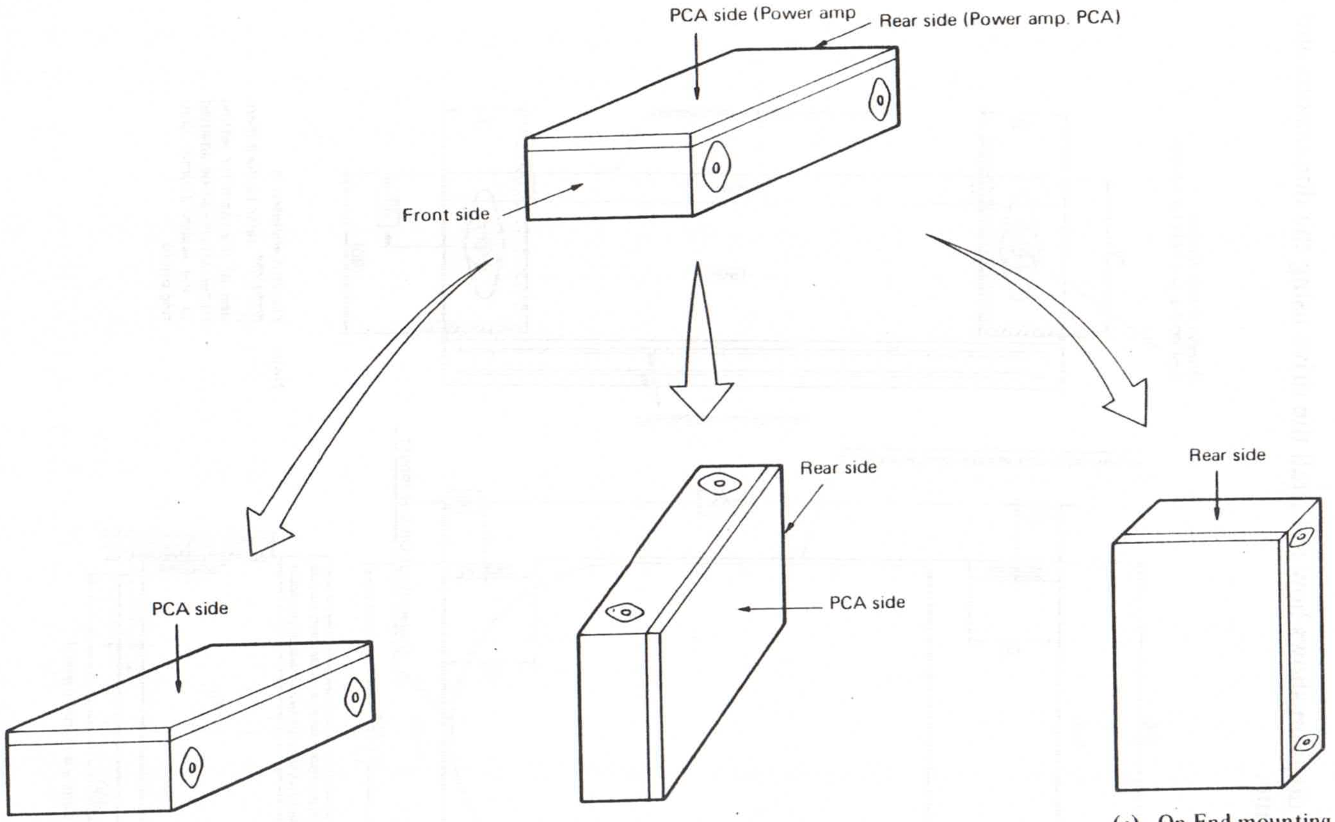
4.1 Installation in a Cabinet

The accompanying diagram shows how to install the drive using the dimensions and structure of the frame.


Rubber shock-isolator
(M4 P0.7 screw hole for fitting)
216
Rear
55
(25)
Underside of vertical (On-side) mount
380
330
50
25
Front
Underside of On-End mount
210
75
55
Printed Circuit Boards
(DE)
(Base)
Underside of horizontal mount
50
60
(80)
127
(DE)
8
200
(Dimensions are in millimeters)

Note: Sections enclosed in ▨ refer to the dimension of the room for setting frame which can be adapted to the width 210mm (Setting pitch).

Figure 4.1 Mounting dimensions



(a) Horizontal mounting
(PCA side up)

(b) On-Side (vertical) mounting
(Left side of drive viewed
from rear side down)

(c) On-End mounting
(Rear side up)

Note:

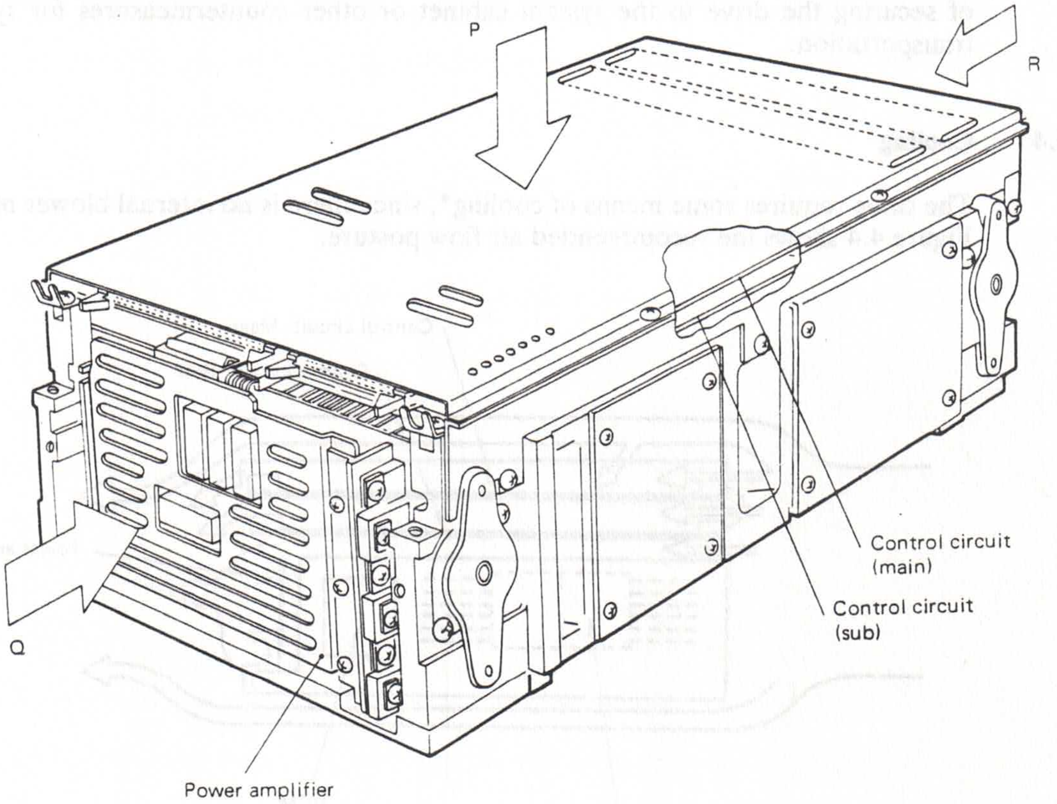
Any mounting other than above is not acceptable.

Figure 4.2 Mounting directions

4.2 Service Area

In the case of maintenance or cable connection, the drive is accessed as shown below.

When determining the service area and where to install, make sure that there is enought room for maintenance work.



P side: Maintenance operation on PCAs (main/sub control circuit)

Q side: Maintenance operation on PCA (power amplifier)

R side: Operating the optional panel unit

Figure 4.3 Maintenance access

4.3 Shock/Vibration Stopper

For this purpose, the rubber shock isolators of this drive have integrated stoppers on both ends of each isolator fitting to limit the amplitude within 3 mm in each direction when the drive is subjected to the specified shock or vibration.

The stoppers act as snubbers after the drive is installed in the system cabinet and they are effective while operation as well as non-operation, thus there is no necessity of securing the drive to the system cabinet or other countermeasures for system transportation.

4.4 Cooling

The drive requires some means of cooling*, since there is no internal blower motor. Figure 4.4 shows the recommended air flow posture.

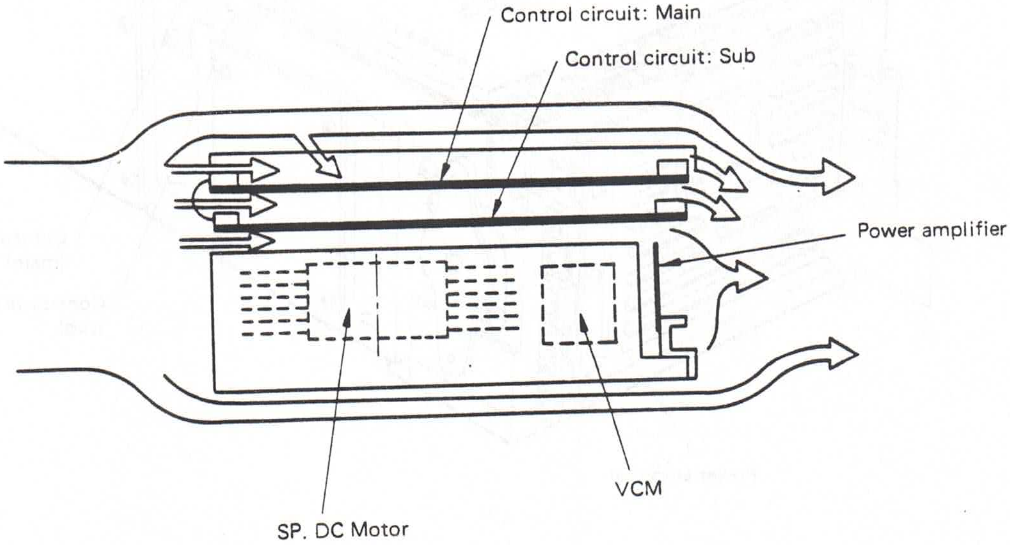


Figure 4.4 Recommended air flow posture

- * For this purpose, an optional fan unit is available. This fan unit will remove the generated heat effectively. (Refer to Subsection 3.2.1.)

The cooling effectiveness shall be confirmed by taking the surface temperatures of some ICs and heat sinks.

The temperatures must be kept under those listed in the Table 4.1 regardless of ambient temperature.

Table 4.1 Thermal check point

Part No.	On Board	Maximum surface Temperature (Tc)
Heat sink (for Power Tr)	Power AMP	70°C
Heat sink (for Voltage Regulator)	Main PCA	95°C
Heat sink	Sub PCA	75°C
Aluminum base (Bottom side)	DE	65°C

- * Random seeking
- * Even at max. environment temperature (40°C)

Check point location is shown below.

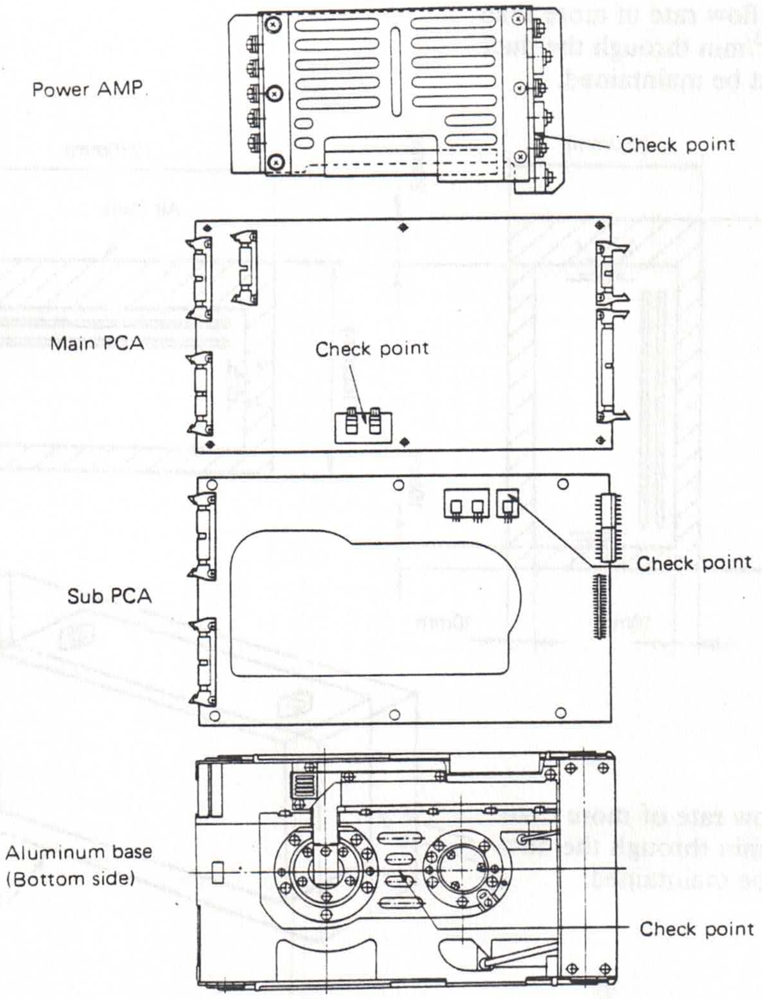
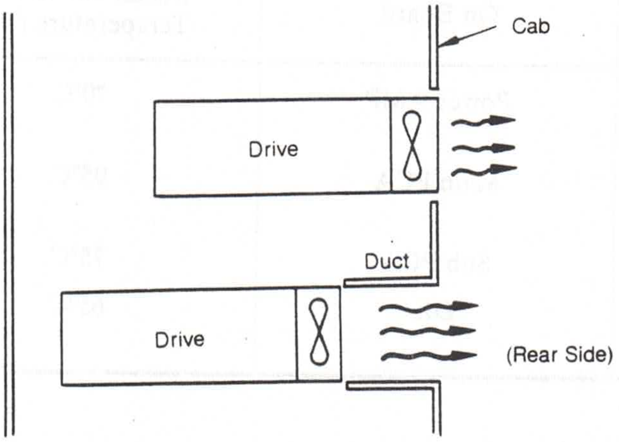


Figure 4.5 Thermal check point location

- Using optional fan unit

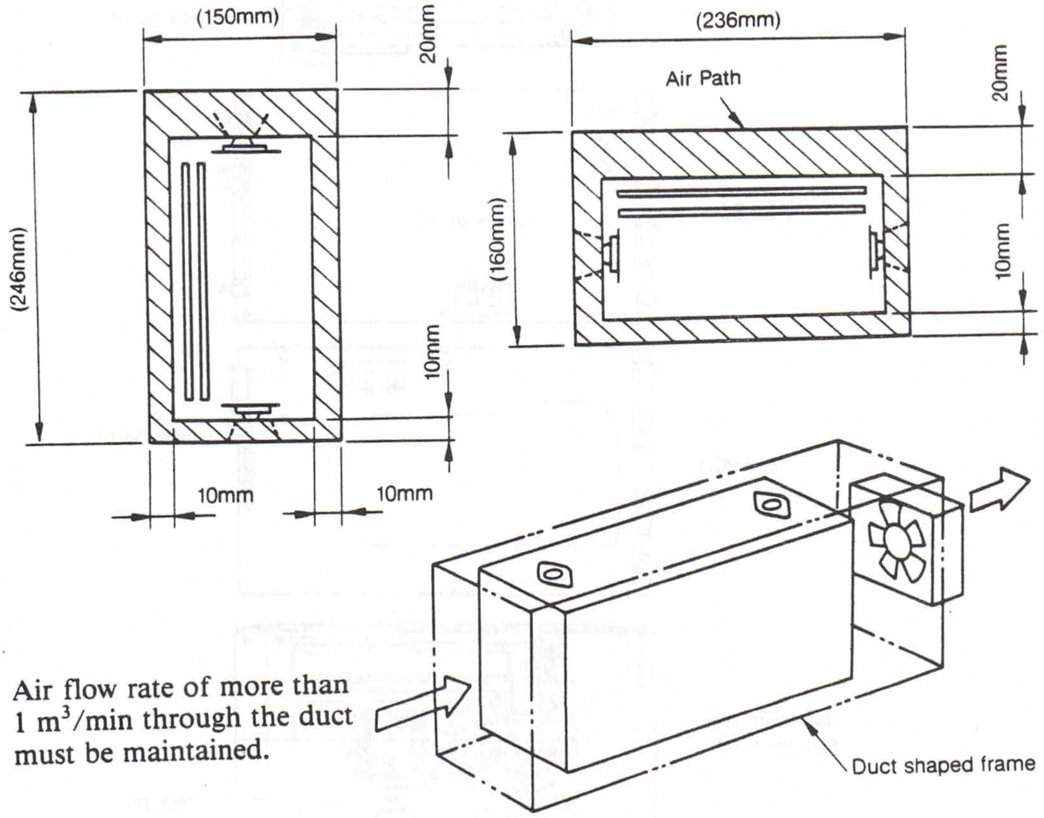


* Warmed air must be exhausted directly out of the cabinet.

- Without optional fan unit

We recommend that the installation frame be shaped like a duct and the cooling air flow path as illustrated in Figure 4.6.

* Air flow rate of more than 1 m^3/min through the duct must be maintained.



* Air flow rate of more than 1 m^3/min through the duct must be maintained.

Figure 4.6 Examples of installation cooling

4.5 Cabling

4.5.1 Connectors on drive side

Figure 4.7 shows the mounting positions of connectors on the drive side.

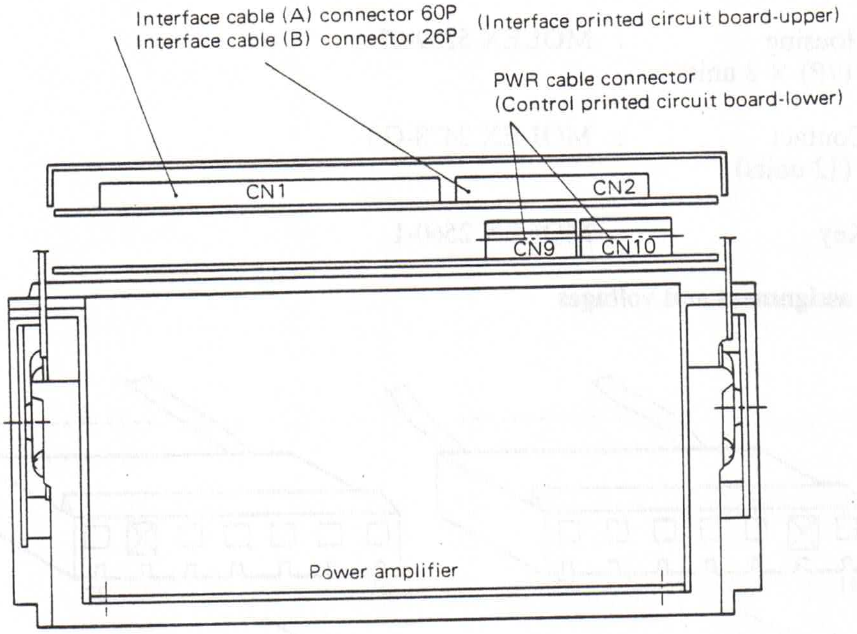

Interface cable (A) connector 60P
Interface cable (B) connector 26P
(Interface printed circuit board-upper)
PWR cable connector
(Control printed circuit board-lower)
CN1
CN2
CN9
CN10
Power amplifier

Figure 4.7 Mounting positions of connectors

Cables connected to this drive include interface cable (A) 60P, interface cable (B) 26P, and power cable.

* The connectors for the power cable consist of two 7P connectors, while the cable side also requires two 7P connectors. See subsection 4.5.2.

4.5.2 Power cable connection

This drive requires DC power source only. The following shows the recommended connector specification for the power cable, and correspondence between pin assignment and voltages.

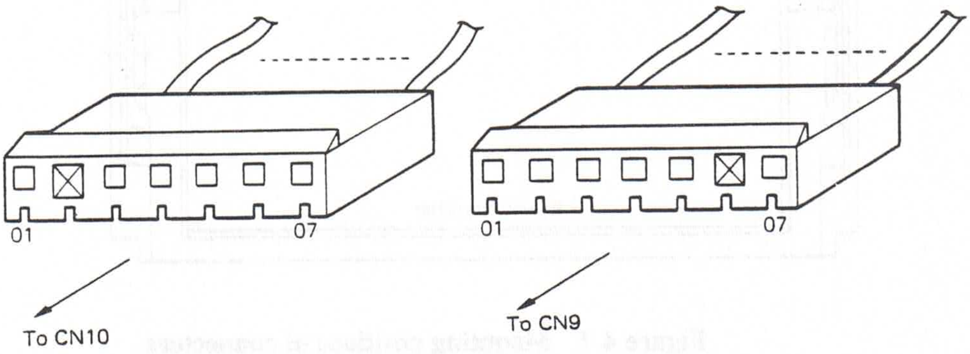
Power connector specification (on the unit PCA)

Header : MOREX 2420-07A-G
(7P) × 2 units

Recommended connector specifications (for power cable)

- Housing : MOLEX 5239-07
  (7P) × 2 units
- Contact : MOLEX 2478-GS
  (12 units)
- Key : MOLEX 2560-1

Pin assignment and voltages



(CN10)

1 0V	(−12V RTN)
2 (Key)	
3 0V	(−12V RTN)
4 −12V	
5 −12V	
6 0V	(+5V RTN)
7 0V	(+5V RTN)

(CN9)

1 +5V	
2 +5V	
3 0V	(+24V RTN)
4 0V	(+24V RTN)
5 +24V	
6 (Key)	
7 +24V	

Notes:

1. Use AWG 18 cable.
2. The cable length must be less than 1.5 m.
3. Two types of optional power cable are available in combination with optional power supply. See Subsection 3.2.4 for details.

4.5.3 Interface cabling

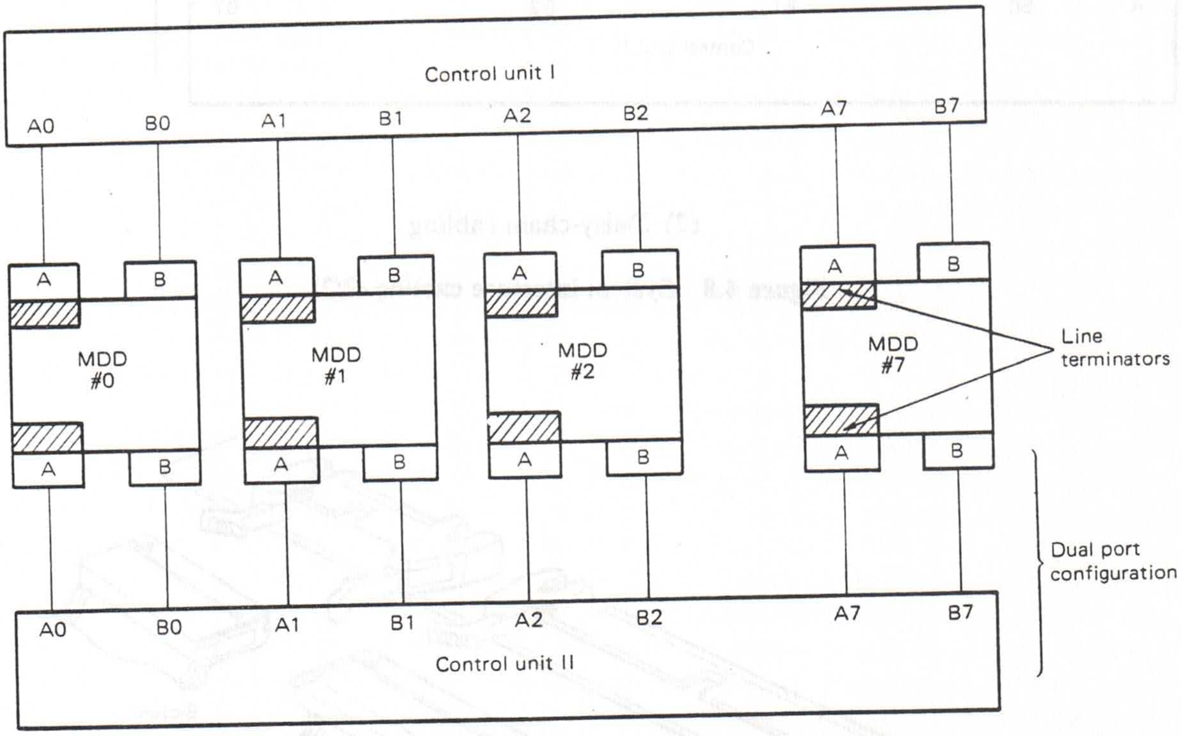
Interface cables include A-cable (60P) for control signals and B-cable (26P) for data signals.

(1) Cabling

Interface cables may be connected to the system in the star-chain mode or the daisy-chain mode, as shown in Figure 4.8. For the star-chain mode, the line terminator resistor packs for A-cable are necessary for each drive to be connected. For the daisy-chain mode, only the last drive requires the line terminator.

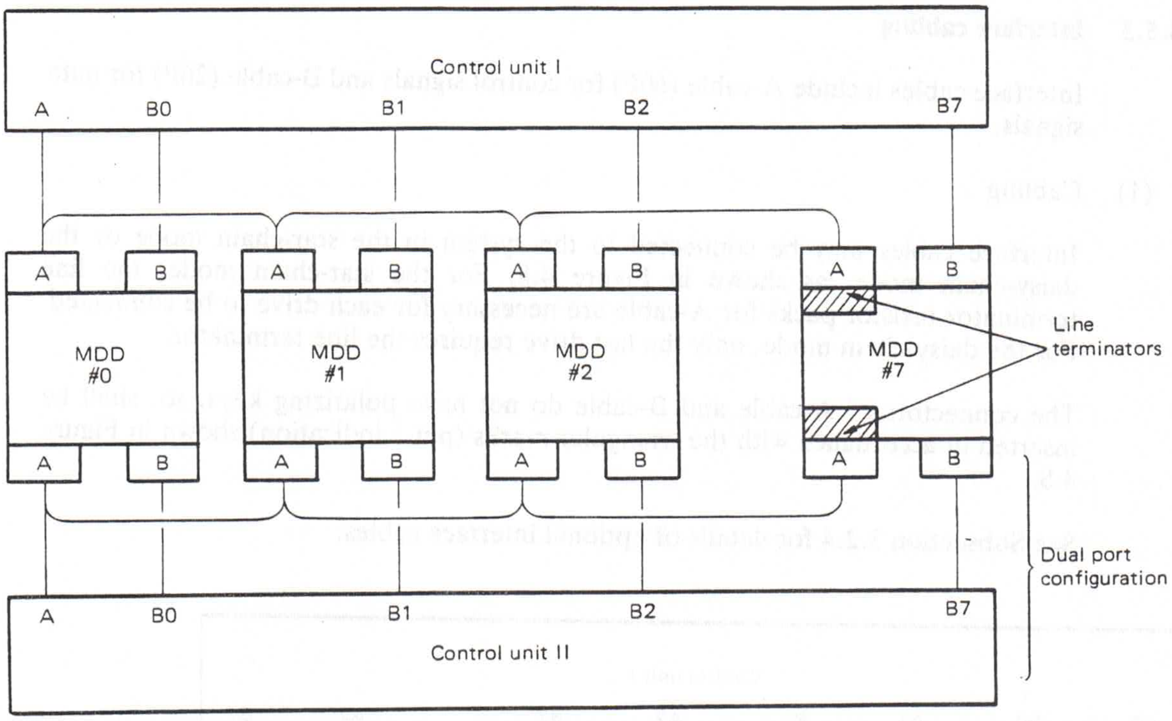
The connectors of A-cable and B-cable do not have polarizing keys, so, shall be inserted in accordance with the triangular marks (pin-1 indication) shown in Figure 4.8.

See Subsection 3.2.4 for details of optional interface cables.



(1) Star-chain cabling (radial)

Figure 4.8 System interface cabling (1/2)



(2) Daisy-chain cabling

Figure 4.8 System interface cabling (2/2)

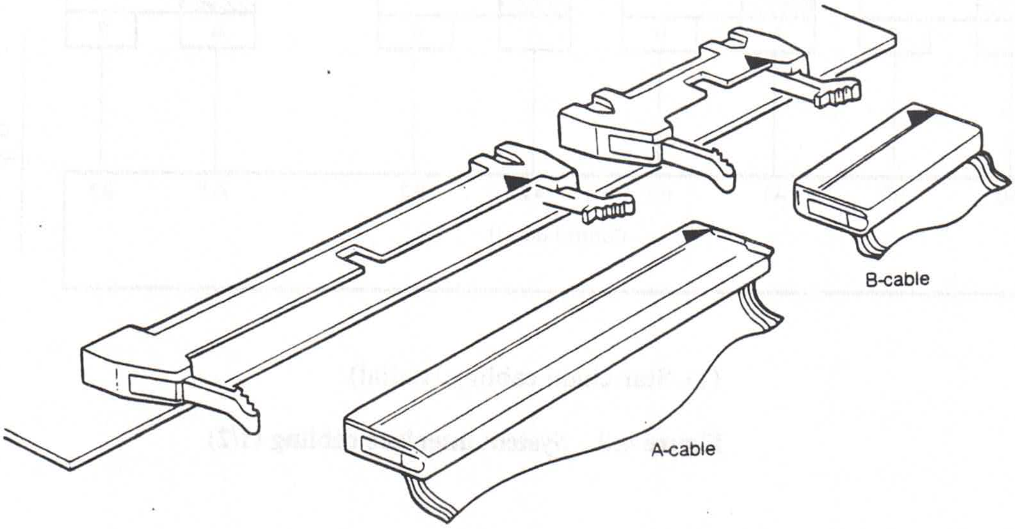


Figure 4.9 Interface cabling

(2) Cable termination

All the drives are shipped with four terminator module-resistors attached on the main control circuit PCA. So, in the case of daisy-chain configuration, the resistors should be removed from the drives on which line-termination is not necessary when installed in the system. Figure 4.10 show the allocation of the module resistors on the main control circuit PCA.

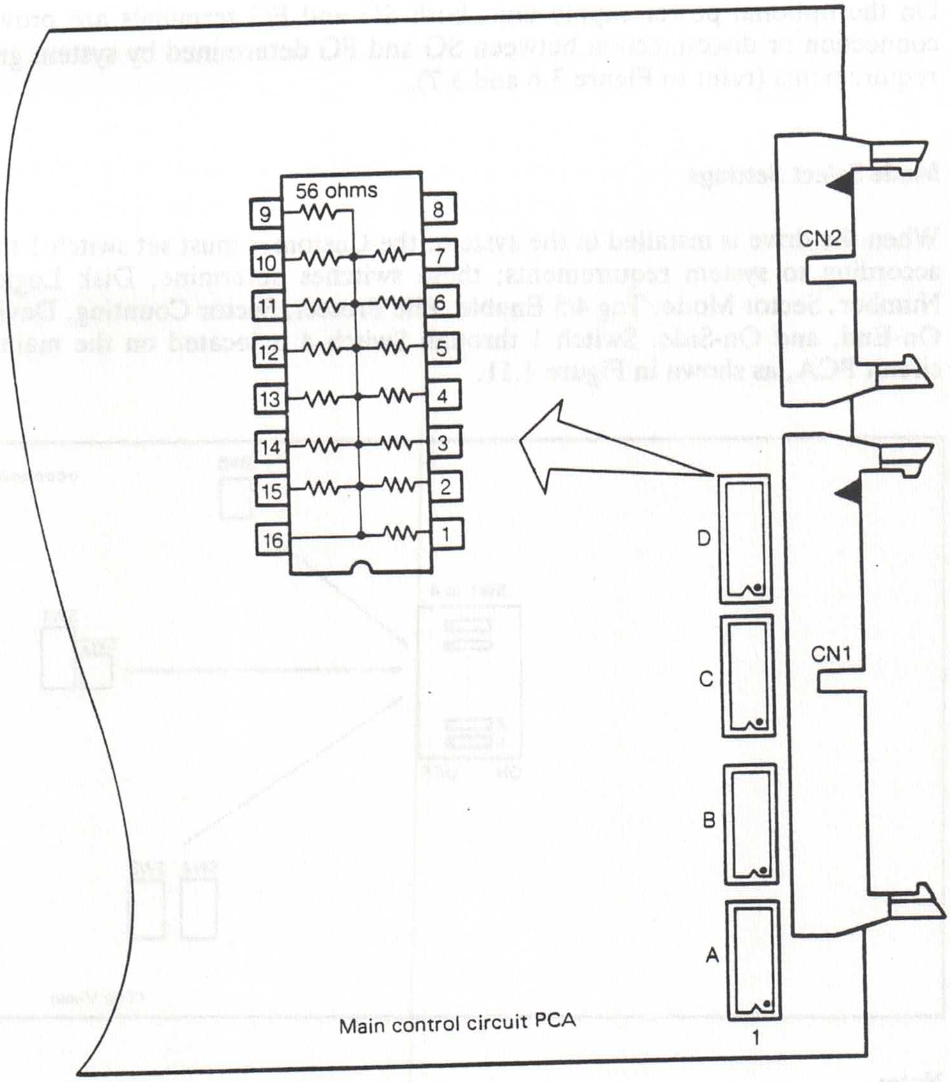


Figure 4.10 Cable termination

4.5.4 System grounding

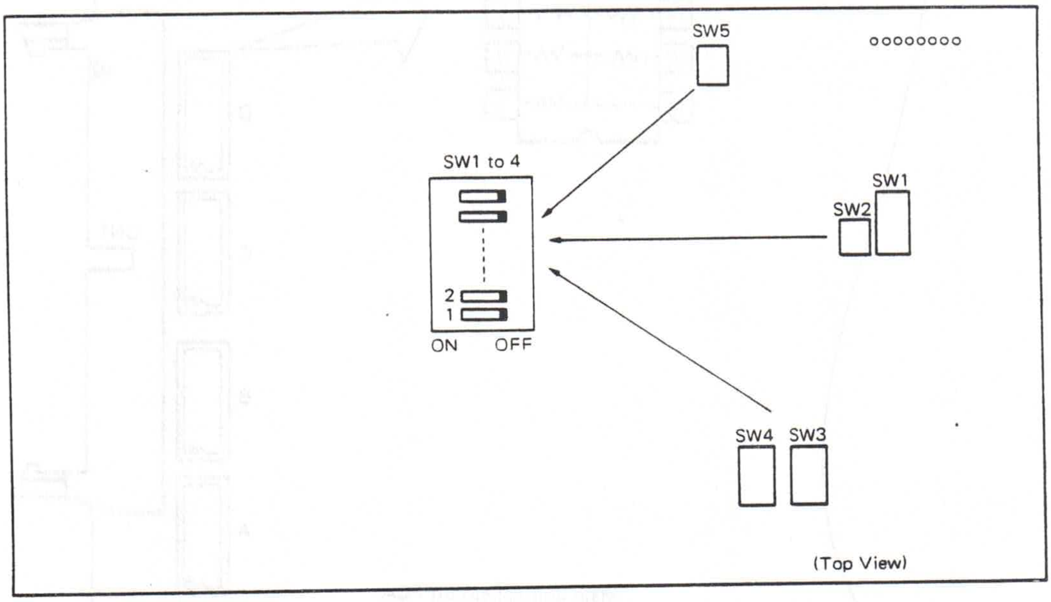
(1) This drive is uniformly grounded to signal ground (SG).

Four SG screw holes are prepared at both ends of front and rear surface of DE casting for the case of SG/FG connection being required in the system (M4 P0.7×6 mm).

(2) On the optional power supply unit, both SG and FG terminals are provided for connection or disconnection between SG and FG determined by system grounding requirements (refer to Figure 3.6 and 3.7).

4.6 Mode Select Settings

When the drive is installed in the system, the Customer must set switch 1 through 4 according to system requirements; these switches determine, Disk Logical Unit Number, Sector Mode, Tag 4/5 Enable, File Protect, Sector Counting, Device type, On-End, and On-Side. Switch 1 through Switch 4 is located on the main control circuit PCA, as shown in Figure 4.11.



Note:

SW1/2/5 consist of 8/4/4 keys, and SW3/4 are 7 keys respectively.

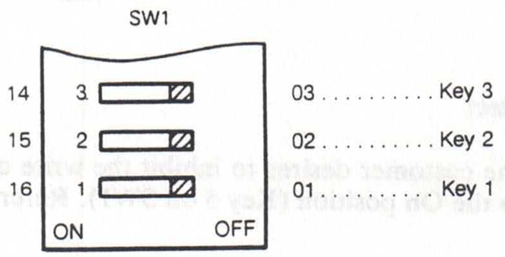
Figure 4.11 Mode Select switch location

4.6.1 Disk addressing

Disk Logical Unit Number 0 to 3 is selected by SW1 on the main control circuit PCA. Set the desired disk address with the three keys on SW1 using the binary code as shown in Table 4.2.

Table 4.2 Disk addressing

Disk Address	Key 1	Key 2	Key 3
	2^1	2^2	2^3
0	OFF	OFF	OFF
1	ON	OFF	OFF
2	OFF	ON	OFF
3	ON	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	ON
6	OFF	ON	ON
7	ON	ON	ON



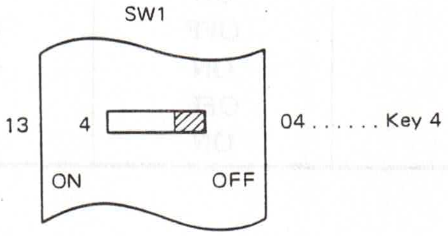
4.6.2 Tag 4/5 enable

This drive provides optional Tag 4 and Tag 5 functions. The customer may enable or enable these optional functions using Key 4 on SW1 on the main control circuit PCA. Refer to Table 4.3.

Disabling the Tag 4 and Tag 5 functions inhibits the receivers of Tag 4 and Tag 5 on the interface. If Tag 4 and Tag 5 are not supported, Key 4 must be in 'OFF' position.

Table 4.3 Tag 4/5 enable

Tag 4/5	Key 4
Eable	ON

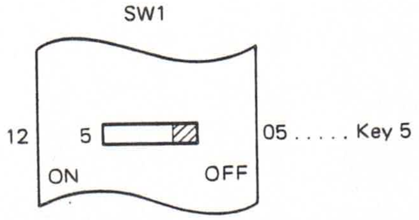


4.6.3 File protect

When the customer desires to inhibit the write operation, the File Protect key may be set to the On position (Key 5 on SW1). Refer to Table 4.4.

Table 4.4 File protect

File Protect	Key 5
Enable writing	OFF
Disable writing	ON



4.6.4 Device type (optional)

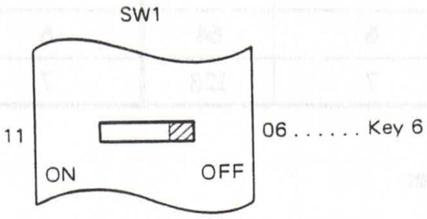
The device type, M2343K/M2344K, can be selected by setting Key 6 on SW1 (See Table 4.5).

Note:

Tag 4/5 feature must be enabled to obtain device type status.

Table 4.5 Device type

Device type	Key 6
M2343K	ON
M2344K	OFF



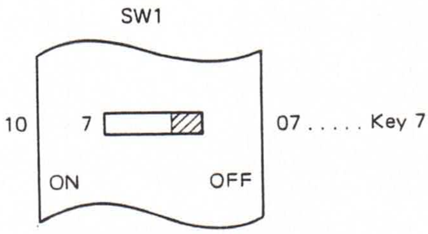
4.6.5 Sector mode

The customer can select Hard Sector mode or Variable Soft Sector mode, using Key 7 on SW1 according to Table 4.6.

In the case of Hard Sector, the customer must set the number of sectors per disk revolution as described in Subsection 4.6.6. Setting the number of sectors per revolution is also available in the Variable Soft Sector mode.

Table 4.6 Sector mode

Sector Mode	Key 7
Hard Sector	OFF
Variable Soft Sector	ON



4.6.6 Sector counting

Sector count configuration switches SW3 and SW4 are located on the main control circuit PCA. Each key of SW3 and SW4 represents the binary powers of the Byte Clock as shown in Table 4.7.

Table 4.7 Sector counting keys

SW 3 Key No.	Value	SW 4 Key No.	Value
1	2	1	256
2	4	2	512
3	8	3	1024
4	16	4	2048
5	32	5	4096
6	64	6	8192
7	128	7	16384

Note:

The value 1 byte is always set by hardware.

SW3 and SW4 keys must be set according to the desired number of bytes per sector. Knowing that the number of bytes possible on a track equals 40,960, any sectoring requirement (sectors per track) can be configured using the following formulas:

(1) Calculation based on Sectors/Track

Example: 9 Sectors/Track

① $\dfrac{40{,}960}{\text{Number of sectors}} = \text{Number of Bytes per sector}$ $\qquad \dfrac{40{,}960}{9} \fallingdotseq 4{,}551.1111$

② If the above calculation results in a remainder, truncate the remainder and add one to the integer portion of "number of bytes per sector". $\qquad 4{,}551 + 1 = 4{,}552$

③ Configure SW3 and SW4 to "number of bytes per sector" less one to allow for Sector Counter Reset Clock. 4,552 − 1 = 4,551

4,551 =4,096 +256 − 128 − 64 − 4 −2 − 1

Keys must be "ON": keys # 5 1 7 6 2 1 See above note.

$\underbrace{5 \quad 1}_{SW4} \quad \underbrace{7 \quad 6 \quad 2 \quad 1}_{SW3}$

④ To determine how many bytes (if any) the last sector of each track will be short, multiply "number of bytes per sector" by "number of sectors" and subtract 40,960.

4,552 × 9 = 40,968
− 40,960

Last sector short 8 bytes

(2) Calculation based on Bytes/Sector

Example: 584 Bytes/Sector

① Calculate the Value to be set.
= 32,769 − (Byte/Sector)
(Particular Value)
= 32,769 − 584
= 32,185

② Select the keys must be OFF position referring to Table 4.8 after the following calculation.

32,185 = 16,384+8,192+4,096+2,048+1,024+256+128+32+16+8+1

Keys must be "OFF" : $\underbrace{7 \quad 6 \quad 5 \quad 4 \quad 3 \quad 1}_{SW4} \quad \underbrace{7 \quad 5 \quad 4 \quad 3}_{SW3}$

③ Calculate the Sectors/Track

$$\text{Sectors Track} = \frac{\text{Bytes/Track}}{\text{Bytes/Sector}}$$

$$= \frac{40{,}960}{584}$$

$$= 70.137$$

④ If the above calculation results in a remainder, truncate the remainder. The integer portion means actual sectors per track.

Actual Sectors/Track = 70

⑤ Calculate the number of the last sector (remainder).

Last Sector Length = 40,960 − (Bytes/Sector) × (Sectors/Track)
= 40,960 − 584 × 70
= 80

Table 4.8 shows sector selection.

Table 4.8 Sector selection (1/2)

Sector	SW 3							SW 4							Byte/ Sector	Last Sector Shorter
	1	2	3	4	5	6	7	1	2	3	4	5	6	7		
1															40,960	0
2	1	1	1	1	1	1	1	1	1	1	1	0	0	1	20,480	0
3	0	1	0	1	0	1	0	1	0	1	0	1	1	0	13,654	−2
4	1	1	1	1	1	1	1	1	1	1	0	0	1	0	10,240	0
5	1	1	1	1	1	1	1	1	1	1	1	1	0	0	8,192	0
6	1	0	1	0	1	0	1	0	1	0	1	1	0	0	6,828	−8
7	1	0	1	1	0	1	1	0	1	1	0	1	0	0	5,852	−4
8	1	1	1	1	1	1	1	1	1	0	0	1	0	0	5,120	0
9	1	1	0	0	0	1	1	1	0	0	0	1	0	0	4,552	−8
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	4,096	0
11	1	0	1	0	0	0	1	0	1	1	1	0	0	0	3,724	−4
12	0	1	0	1	0	1	0	1	0	1	1	0	0	0	3,414	−8
13	1	1	1	0	0	1	0	0	0	1	1	0	0	0	3,152	−16
14	0	1	1	0	1	1	0	1	1	0	1	0	0	0	2,926	−4
15	1	0	1	0	1	0	1	0	1	0	1	0	0	0	2,732	−20
16	1	1	1	1	1	1	1	1	0	0	1	0	0	0	2,560	0
17	0	0	1	0	1	1	0	1	0	0	1	0	0	0	2,410	−10
18	1	0	0	0	1	1	1	0	0	0	1	0	0	0	2,276	−8
19	1	0	1	0	1	1	0	0	0	0	1	0	0	0	2,156	−4
20	1	1	1	1	1	1	1	1	1	1	0	0	0	0	2,048	0
21	1	1	1	1	0	0	1	1	1	1	0	0	0	0	1,952	−32
22	0	1	0	0	0	1	0	1	1	1	0	0	0	0	1,862	−4
23	0	1	0	1	1	1	1	0	1	1	0	0	0	0	1,782	−26
24	1	0	1	0	1	0	1	0	1	1	0	0	0	0	1,708	−32
25	1	1	0	0	1	1	0	0	1	1	0	0	0	0	1,640	−40
26	1	1	0	0	1	0	0	0	1	1	0	0	0	0	1,576	−16
27	0	1	1	0	1	1	1	1	0	1	0	0	0	0	1,518	−26
28	1	1	0	1	1	0	1	1	0	1	0	0	0	0	1,646	−32
29	0	1	0	0	0	0	1	1	0	1	0	0	0	0	1,414	−46
30	0	1	0	1	0	1	0	1	0	1	0	0	0	0	1,366	−20
31	0	0	1	0	1	0	0	1	0	1	0	0	0	0	1,322	−22
32	1	1	1	1	1	1	1	0	0	1	0	0	0	0	1,280	0
33	0	0	1	1	0	1	1	0	0	1	0	0	0	0	1,242	−26
34	0	1	0	1	1	0	1	0	0	1	0	0	0	0	1,206	−44
35	1	0	0	1	0	0	1	0	0	1	0	0	0	0	1,172	−60
36	0	0	0	1	1	1	0	0	0	1	0	0	0	0	1,138	−8
37	1	0	0	1	0	1	0	0	0	1	0	0	0	0	1,108	−36
38	0	1	0	1	1	0	0	0	0	1	0	0	0	0	1,078	−4
39	1	0	1	1	0	0	0	0	0	1	0	0	0	0	1,052	−64
40	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1,024	0
41	1	1	0	0	1	1	1	1	1	0	0	0	0	0	1,000	−40
42	1	1	1	0	0	1	1	1	1	0	0	0	0	0	976	−32

Table 4.8 Sector selection (2/2)

Sector	SW 3							SW 4							Byte/ Sector	Last Sector Shorter
	1	2	3	4	5	6	7	1	2	3	4	5	6	7		
43	0	0	1	1	1	0	1	1	1	0	0	0	0	0	954	−62
44	1	0	0	0	1	0	1	1	1	0	0	0	0	0	932	−48
45	1	1	1	0	0	0	1	1	1	0	0	0	0	0	912	−80
46	1	0	1	1	1	1	0	1	1	0	0	0	0	0	892	−72
47	1	1	0	0	1	1	0	1	1	0	0	0	0	0	872	−24
48	0	1	0	1	0	1	0	1	1	0	0	0	0	0	854	−32
49	1	0	0	0	0	1	0	1	1	0	0	0	0	0	836	−4
50	1	0	0	1	1	0	0	1	1	0	0	0	0	0	820	−40
51	1	0	0	0	1	0	0	1	1	0	0	0	0	0	788	−32
52	1	0	0	1	0	0	0	1	1	0	0	0	0	0	804	−16
53	0	1	0	0	0	0	0	1	1	0	0	0	0	0	774	−62
54	1	1	0	1	1	1	1	0	1	0	0	0	0	0	760	−80
55	0	0	1	0	1	1	1	0	1	0	0	0	0	0	746	−70
56	1	0	1	1	0	1	1	0	1	0	0	0	0	0	732	−32
57	1	1	1	0	0	1	1	0	1	0	0	0	0	0	720	−80
58	1	0	0	0	0	1	1	0	1	0	0	0	0	0	708	−104
59	1	1	0	1	1	0	1	0	1	0	0	0	0	0	696	−104
60	1	0	1	0	1	0	1	0	1	0	0	0	0	0	684	−80
61	1	1	1	1	0	0	1	0	1	0	0	0	0	0	672	−32
62	0	1	0	1	0	0	1	0	1	0	0	0	0	0	662	−84
63	1	0	1	0	0	0	1	0	1	0	0	0	0	0	652	−116
64	1	1	1	1	1	1	0	0	1	0	0	0	0	0	640	0
65	1	1	0	1	1	1	0	0	1	0	0	0	0	0	632	−120
66	0	1	1	0	1	1	0	0	1	0	0	0	0	0	622	−96
67	1	0	0	0	1	1	0	0	1	0	0	0	0	0	612	−44
68	1	0	1	1	0	1	0	0	1	0	0	0	0	0	604	−112
69	0	0	0	1	0	1	0	0	1	0	0	0	0	0	594	−26
70	0	0	1	0	0	1	0	0	1	0	0	0	0	0	586	−60
71	0	0	0	0	0	1	0	0	1	0	0	0	0	0	578	−78
72	0	0	1	1	1	0	0	0	1	0	0	0	0	0	570	−80
80	1	1	1	1	1	1	1	1	0	0	0	0	0	0	512	0
128	1	1	1	1	1	0	0	1	0	0	0	0	0	0	320	0

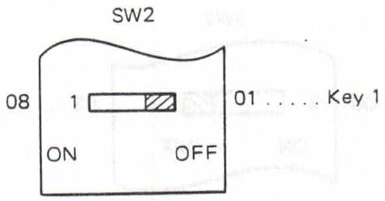
Notes:

1. "1" indicates that the key is set to ON side.
2. "0" indicates that the key is set to OFF side.
3. The last sector is equal or shorter than nominal sector.

4.6.7 Calibration seek

In the case of exchanging PCAs, calibration seek operation must be performed to determine internal circuit constant of head positioning servo system. The procedure is as follows:

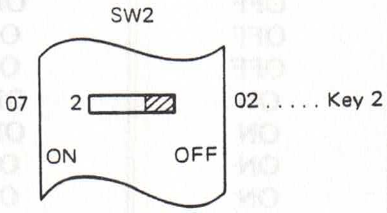
① Set Key 1 of SW2 to ON position before turning on the unit power source.
② Turn on the unit power switch.
③ When the calibration is finished STS1 LED begins turning on and off, then put back the key to OFF position.
④ The unit results in Ready status.



4.6.8 On-End Switch (for On-End mount)

When the drive is installed to the On-End position, Key 2 must be in the 'ON' Position. When unit is horizontally or vertically mounted, Key 2 must be 'OFF'.

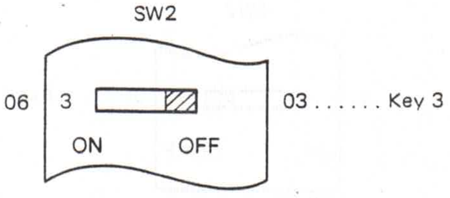
	Key 2
Other position	OFF
On-End position	ON



4.6.9 ON-Side switch (for vertical mount)

When the drive is installed to the On-Side position, (Vertical mount) Key 3 must be in the 'ON' position. When drive is horizontally mounted, Key 3 must be 'OFF'.

	Key 3
Normal position	OFF
ON-Side position	ON

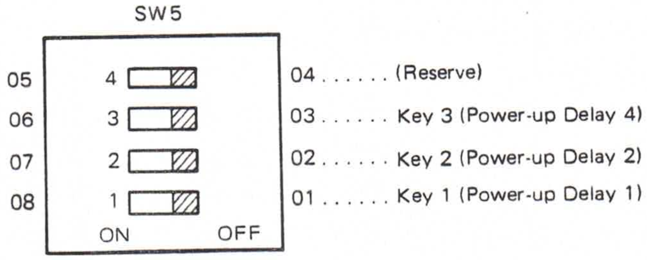


4.6.10 Spindle start delay switch

SW5 can specify start-up timing delay of the spindle motor as shown in Table 4.9 to reduce the accumulation of +24 V peak load current at power-up sequence in the case of using multiple-drive power supply.

Table 4.9 Spindle start delay setting

Delay (seconds)	Key 3	Key 2	Key 1
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON


SW5
05
06
07
08
4
3
2
1
ON
OFF
04 . . . . . . (Reserve)
03 . . . . . . Key 3 (Power-up Delay 4)
02 . . . . . . Key 2 (Power-up Delay 2)
01 . . . . . . Key 1 (Power-up Delay 1)

CHAPTER 5 OPERATION

This chapter describes unit power up/down, functions of unit status LEDs on the main control circuit PCA, optional panel unit and optional power supply unit.

5.1 Powering Up/Down

The drive itself is not equipped with a power control switches, and the power source shall be controlled by the system power supply or optional power supply when it is equipped.

5.2 Control and Indicators

5.2.1 Optional panel unit

The functions of the LEDs and switches on optional panel unit (front panel) are described below.

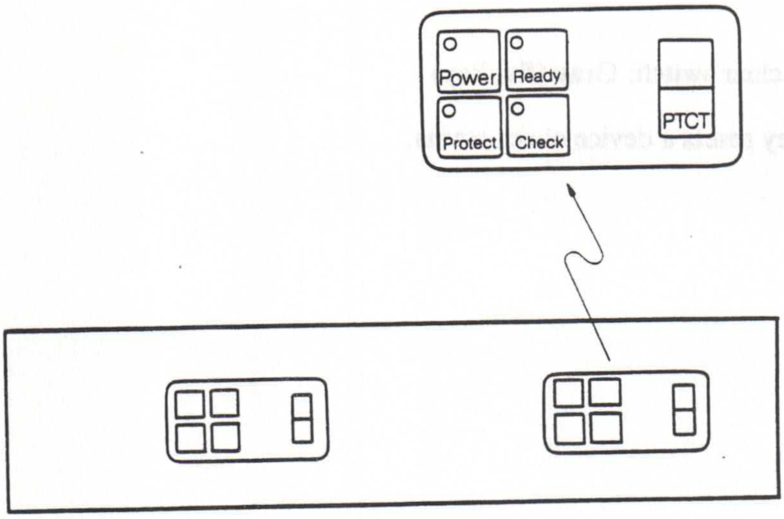


Figure 5.1 Optional panel unit

(1) Power indicator: Red

This LED indicates unit's power on status.

(2) Ready indicator: Red

This LED indicates the initial seek completion or the termination of a Seek or RTZ operation.

(3) Check indicator: Red

This LED indicates unit's fault condition.

(4) Protect indicator: Red

This LED indicates write operation is inhibited.

(5) Protect (PTCT) switch: White

This key enables write protect condition.

(6) Check clear switch: Gray (flat key)

This key resets a device check status.

5.2.2 Main control circuit PCA

The drive contains fault display indicator (LEDs) located on the main control circuit PCA as shown Figure 5.2.

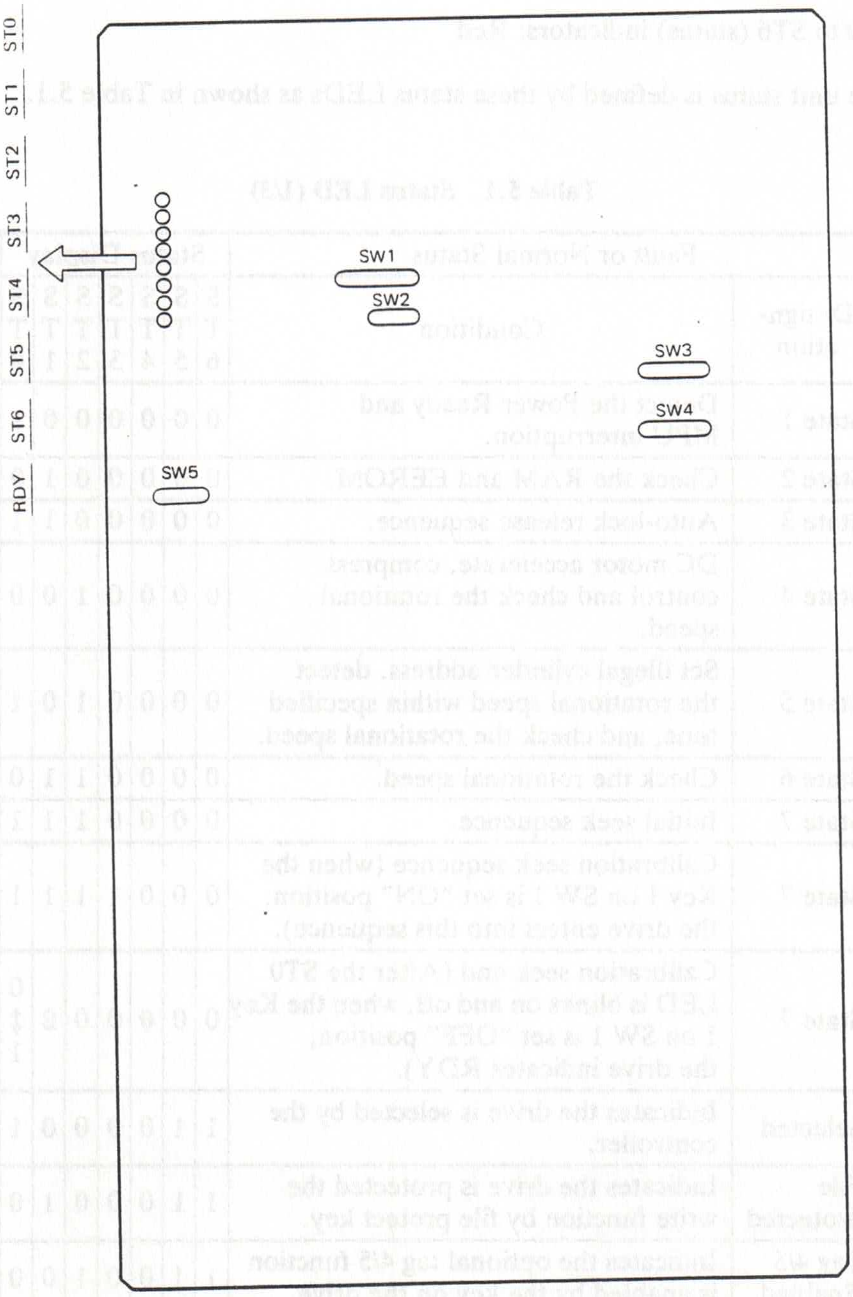


Figure 5.2 Fault display location on main control circuit PCA

(1) RDY (Ready) indicator: Green

This RDY LED indicates the initial completion or the termination of a seek or RTZ operation.

(2) ST0 to ST6 (status) indicators: Red

The unit status is defined by these status LEDs as shown in Table 5.1.

Table 5.1 Status LED (1/3)

Status	Fault or Normal Status		Status Display							Diagnostic Panel Code (Hex)
	Design-ation	Condition	ST6	ST5	ST4	ST3	ST2	ST1	ST0	
Normal Power up Sequ-ence	State 1	Detect the Power Ready and MPU interruption.	0	0	0	0	0	0	1	01
	State 2	Check the RAM and EEROM.	0	0	0	0	0	1	0	02
	State 3	Auto-lock release sequence.	0	0	0	0	0	1	1	03
	State 4	DC motor accelerate, compress control and check the rotational speed.	0	0	0	0	1	0	0	04
	State 5	Set illegal cylinder address, detect the rotational speed within specified time, and check the rotational speed.	0	0	0	0	1	0	1	05
	State 6	Check the rotational speed.	0	0	0	0	1	1	0	06
	State 7	Initial seek sequence.	0	0	0	0	1	1	1	07
	State 7	Calibration seek sequence (when the Key 1 on SW 1 is set "ON" position, the drive enters into this sequence).	0	0	0	1	1	1	1	08
	State 7	Calibration seek end (After the ST0 LED is blinks on and off, when the Key 1 on SW 1 is set "OFF" position, the drive indicates RDY).	0	0	0	0	0	0	0 ↕ 1	0A
Ready Status	Selected	Indicates the drive is selected by the controller.	1	1	0	0	0	0	1	00
	File protected	Indicates the drive is protected the write function by file protect key.	1	1	0	0	0	1	0	
	Tag 4/5 Enabled	Indicates the optional tag 4/5 function is enabled by the key on the drive.	1	1	0	0	1	0	0	
Power up Sequ-ence inhibit Status	State 1	Indicates the condition to Power Ready is not correct and the drive detect the MPU interruption.	0	0	0	0 ↕ 1	0	0	1	31
	State 2	Indicates an abnormal condition of RAM and EEROM.	0	0	0	0 ↕ 1	0	1	0	32

Table 5.1 Status LED (2/3)

Status	Fault or Normal Status		Status Display							Diagnostic Panel Code (Hex)
	Design-ation	Condition	ST6	ST5	ST4	ST3	ST2	ST1	ST0	
Power up Sequence inhibit Status	State 3	Indicates the accuator lock is not released.	0	0	0	0↕1	0	1	1	33
	State 4	Indicates the DC motor acceleration is not correct.	0	0	0	0↕1	1	0	0	3C
	State 4	Indicates DCM acceleration time out (Start → 1600 rpm).	0	0	0↕1	0↕1	1	0	0	34
	State 5	Indicates DCM acceleration time out (1600 rpm → SPDG).	0	0	0↕1	0↕1	1	0	1	35
	State 6	Indicates DCM acceleration time out (SPDG → 3600 rpm).	0	0	0↕1	0↕1	1	1	0	36
	State 7	Indicates the Initial Seek Error condition.	0	0	0	0↕1	1	1	1	3F
	State 7	Indicates the initial seek is not terminated with in the specified time.	0	0	0↕1	0↕1	1	1	1	37
	State 7	Indicates the calibration seek fault condition.	0	0	0↕1	0↕1	0↕1	0↕1	0↕1	3A
Fault Status	Control Check	Indicates a Seek, RTZ or Offset command is issued during busy or Seek Error condition.	0	1	×	×	0	0	1	11
	Control Check	Indicates a Read or Write command is issued during Seek Error, Not Ready and Not On Cylinder condition. Indicates a Write command is issued during Read or Offset condition.	0	1	×	×	0	1	0	12
	Write Off-Track	Indicates an off-Track condition occurs during write operation.	0	1	×	×	0	1	1	13
	Write Unsafe	Indicates a write operation can not be performed due to a write circuit fault.	0	1	×	×	1	0	0	14
	File Protected	Indicates a Write command is issued during File-protected status.	0	1	×	×	1	0	1	15

Table 5.1 Status LED (3/3)

Status	Fault or Normal Status		Status Display							Diagnostic Panel Code (Hex)
	Design-ation	Condition	ST6	ST5	ST4	ST3	ST2	ST1	ST0	
Fault Status	Read/ write Multi	Indicates multiple heads are selected during a read or write operation.	0	1	×	×	1	1	0	16
	VCN Heat	Indicates over-load current flows on VCM.	0	1	0	0↕1	1	1	1	17
	DC Motor Fault	Indicates the DC motor occurred an abnomal condition.	0	1	0↕1	0	1	1	1	1F
Seek Error	RTZ Time-out	Indicates a RTZ operation is not terminated within the specified time.	1	0	×	×	0	0	1	21
	Seek Time-out	Indicates a seek operation is not terminated within the specified time.	1	0	×	×	0	1	0	22
	Over-shoot	Indicates the head moves out during track following sequence in linear mode.	1	0	×	1	0	1	1	2B
	Not Speed good	Indicates a Seek command is issued during Not Speed Good condition.	1	0	×	0	0	1	1	23
	Seek Guard Band	Indicates the guard band is detected during seek operation.	1	0	×	×	1	0	0	24
	Linear Mode Guard Band	Indicates the guard band is detected during linear mode.	1	0	×	×	1	0	1	25
	Illegal Cylinder	Indicates an illegal cylinder address (>623) is issued by the controller.	1	0	×	×	1	1	1	27

5.3 Power Supply

The optional power supply is available for M2343K/M2344K. Figure 5.3 shows the front view of the power supply.

(1) Main Line switch

This switch controls application of site AC power to the power supply. Turning on the switch applies power to an optional fan unit and the drive.

(2) Indicators (LEDs)

(a) Power On LED

The Power On LED indicates that AC input is applied to the power supply.

(b) Power Alarm LED

The power alarm indicates the following malfunction has occurred.

- +5 V DC: Over current, Over-voltage and Non-voltage
- −12 V DC: Over-current and Non-voltage
- +24 V DC: Over-current and Non-voltage
- Overheat within the power supply

(3) Device Alarm

The Device Alarm indicates that the thermal switch has been closed on the optional fan.

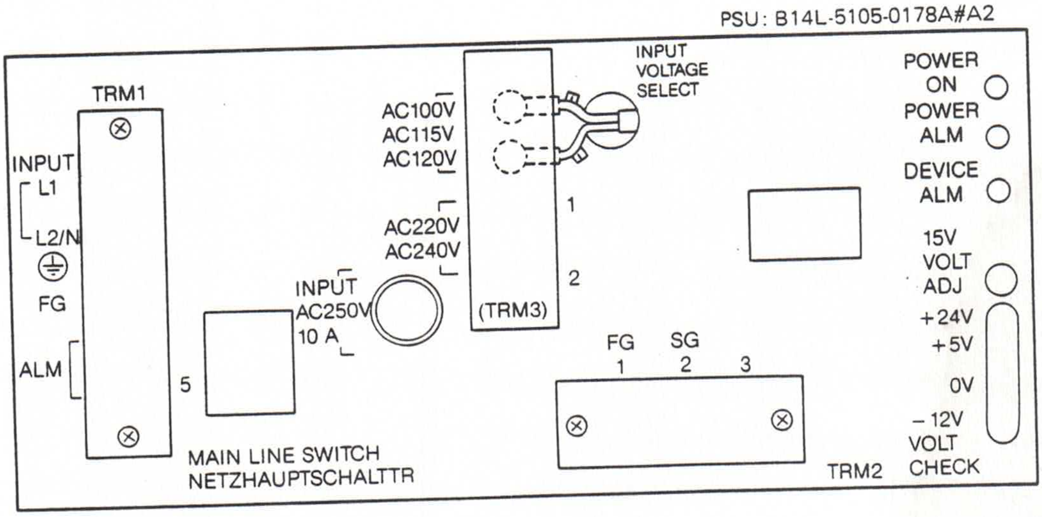


Figure 5.3 Front view of power supply unit

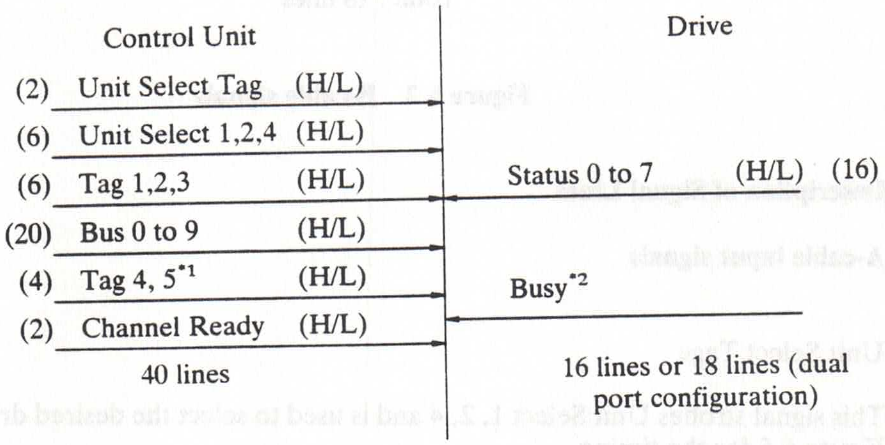
CHAPTER 6 INTERFACE

This chapter describes the physical and logical conditions of the signal transmission through the interface between the drive and control unit.

The timing is specified at the connector position of the drive unless otherwise specified. Accordingly, it is necessary for signal timings to consider both the delay time in the interface cables (approximately 5 ns/m) and the delay time in the control unit. A circuit delay in the drive from the drive side connectors (A and B) has been considered in the specified time in this manual.

6.1 Signal Lines

6.1.1 A-cable signal lines



Total: 56 lines or 58 lines (dual port configuration)

Notes:

*1 Functions of Tag 4 and Tag 5 can be disabled. See Subsection 6.2.1.

*2 Busy signals are used only when the dual port option is used.

Figure 6.1 A-cable signals

6.1.2 B-cable signal lines

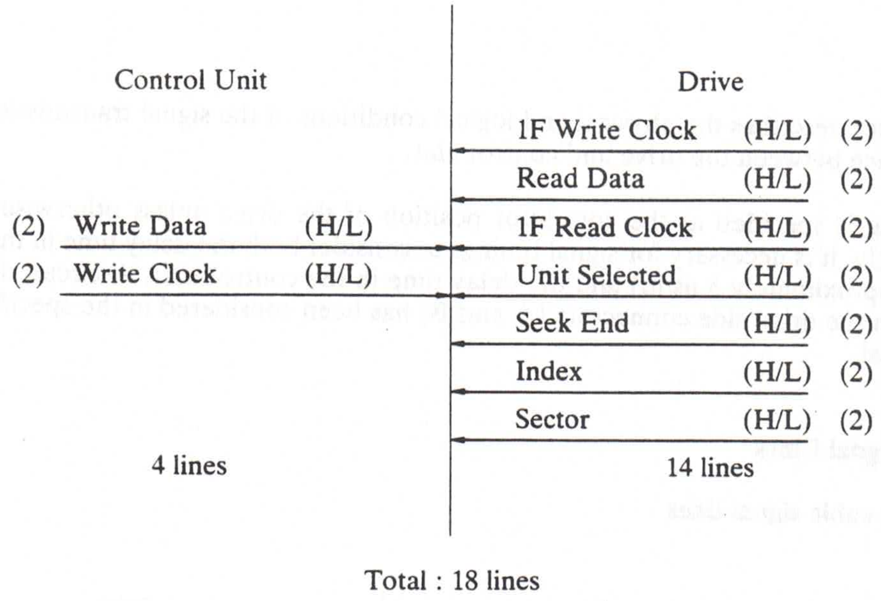


Figure 6.2 B-cable signals

6.2 Description of Signal Lines

6.2.1 A-cable input signals

(1) Unit Select Tage

This signal strobes Unit Select 1, 2, 4 and is used to select the desired drive. Refer to Figure 6.5 for the timing.

(2) Unit Select 1, 2, 4

These three signals are binary coded to select the desired disk and are validated by the leading edge of Unit Select Tag. The drive Logical Unit Number is selectable on the main control circuit PCA by setting a DIP switch. LUNs of 0 to 7 are selectable. See Subsection 4.6.1.

(3) Tag/Bus

The contents of the 10-bit bus, defined by Tag 1, 2 and 3, are shown in Table 6.1.

Table 6.1 Tag/Bus lines

BUS	Tag 1 Cylinder Address	Tag 2 Head Address	Tag 3 Control Select	Unit Select Tag
0	1	1	Write Gate	
1	2	2	Read Gate	
2	4	4	Servo Offset Plus	
3	8	8	Servo Offset Minus	
4	16	–	Fault Clear	
5	32	–	AM Enable	
6	64	–	RTZ	
7	128	–	–	
8	256	–	–	
9	512	–	Release*	Priority Select*

Note:

Used only with Dual Channel option.

(a) Cylinder Address (Tag 1)

The cylinder address is gated by the leading edge of Tag 2, and the contents of bus lines (Bus 0 to 9) are set in the cylinder address register of the drive. The bus lines must be stable prior to Tag 1, and must be stable throughout Tag 1. Refer to Figures 6.7 and 6.8.

(b) Head Address (Tag 2)

The head address is gated by the leading edge of Tag 2, and the contents of bus lines (Bus 0 to 3) are set in the head address register of the drive. The bus lines must be stable prior to Tag 2 and must be stable throughout Tag 2. Refer to Figures 6.9 and 6.10. The Cylinder/Head addressing of M2343K/M2344K is shown in Figures 6.3 and 6.4.

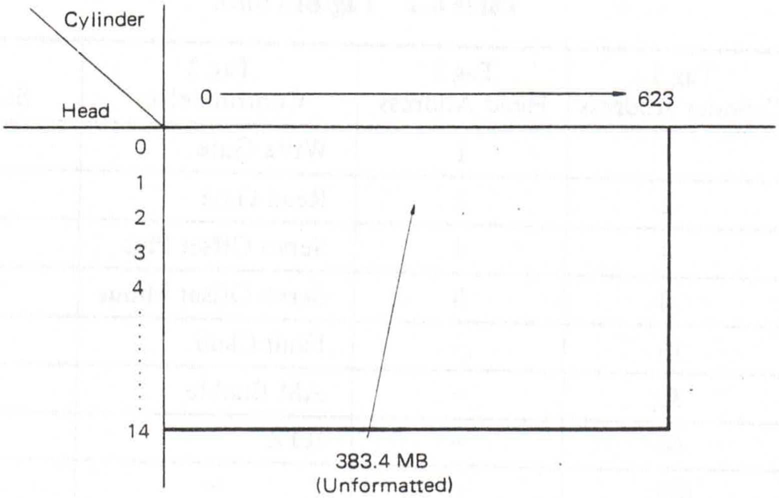


Figure 6.3 M2343K cylinder/head addressing

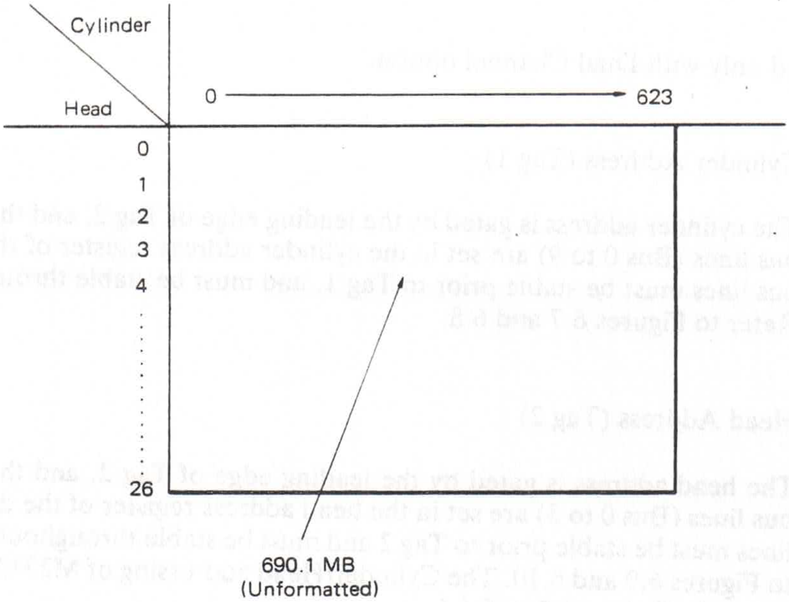


Figure 6.4 M2344K cylinder/head addressing

(c) Control Select (Tag 3)

Bus lines (0 to 9) enabled by Tag 3 have a different measing for each bit. All signals are defined as control signals.

a. Write Gate (Bus Bit 0)

This signal enables the write operation on the specified track/sector. This signal is validated under the following conditions:

Unit Ready	True
On cylinder	True
Seek End	True
Seek Error	False
Fault	False
File Protect	False
Offset	False

Refer to Figures 6.5 and 6.6.

b. Read Gate (Bus Bit 1)

This signal is used to read data from the specified track/sector. Refer to Figure 6.7.

c. Offset Plus (Bus Bit 2)

This signal is used to recover an error and the head is offset 2 - 3 μm in an out-ward direction. The drive will issue On Cylinder and Seek End signals to the controller when the operation is completed. Refer to Figure 6.11.

d. This signal is used to recover an error and the head is offset 2 - 3 μm in an in-ward direction. The drive will issue On Cylinder and Seek End signals to the controller when the operation is completed. Refer to Figure 6.11.

e. Fault Clear (Bus Bit 4)

This signal clears the Fault status; however, if sources of a fault still exist, this status is not cleared. Refer to Figure 6.12.

f. AM Enable (Bus Bit 5)

The AM (Address Mark) Enable, in conjunction with Read or Write Gate, is used in a Variable Sector format. When Write Gate and AM Enable are simultaneously set, AM is written. Refer to Figure 6.24.

When Read Gate and AM Enable are simultaneously set, the disk read circuit searches AM, and when it encounters 3 bytes of DC erased area, the drive will issue the AM Found signal to the control unit. Refer to Figure 6.25.

g. Return to Zero (RTZ) (Bus Bit 6)

No matter where the access heads are located on the disk, they are returned to cylinder zero and head zero by the RTZ signal. This signal clears Seek Error.

h. Release (But Bit 9)

Asserting this command will release Channel Reserve and Unconditionally Reserve in the drive, making alternate channel access possible after selection by the channel ceases.

If a customer desires to use the Release Timer feature with the Release Timer switch on the optional dual channel PCA, release will occur 500 ms (nominal) following the deselection of the drive. Refer to Figures 6.5 and 6.6.

(4) Priority Select (Unit Select Tag-Bus bit 9: Dual Channel)

When the control unit issues Unit Select Tag and Bus Bit 9 with a specified disk address, the drive will be unconditionally selected and absolutely reserved by the channel issuing this command providing both channels are enabled and a priority select condition does not exist on the opposite channel.

Once the drive is unconditionally reserved by Priority Select command, that channel has exclusive access to the drive. The opposite channel can access only after Release command has been issued by the selected channel. Refer to Figure 6.6.

When the drive is unconditionally reserved, all interface signals are inhibited on the opposite channel including the Unit Selected and Busy signals.

(5) Tag 4/5 (Optional)

The function of these signals can be inhibited by a switch in the drive. These signals gate additional information on Status 0 to 7 line of the A Cable. Refer to Figure 6.14.

(6) Channel Ready

This signal is used to prevent damage to the file caused by interface disturbances when control unit power is lost. Therefore, this signal must be true when the controller is available and must be off before logic levels decay at the interface when a power failure of the control unit occurs. Refer to Figure 6.18. Unit Select is impossible when Channel Ready is false.

6.2.2 A Cable output signals

(1) Status 0 to 7

The status 0 to 7 lines are determined by the logical combination of Tag 4 and Tag 5 signals as in Table 6.2.

Table 6.2 Status lines determined by Tag 4/5

Tag 4	False	True	False	True
Tag 5	False	False	True	True
Status	Unit Status	Sector Count Status	Fault/Seek Error Status	Device Type
0	Unit Ready	Sector Address 1	Fault 1	Device Type 1
1	On Cylinder	Sector Address 2	Fault 2	Device Type 2
2	Seek Error	Sector Address 4	Fault 4	Device Type 4
3	Device Check	Sector Address 8	Seek Error 1	Device Type 8
4	File Protected	Sector Address 16	Seek Error 2	Device Type 16
5	AM Found	Sector Address 32	Seek Error 4	Device Type 32
6	INDEX	Sector Address 64	VCMHT	Device Type 64
7	SECTOR	Sector Address 128	DMFT	Device Type 128

Note:

Tag 4 and Tag 5 can be inhibited by the Tag 4 and Tag 5 disable switch in the drive. When Tag 4 and Tag 5 are disabled, Status 0 to 7 lines indicate Unit Status only.

(a) Unit Status (Unit must be selected)

a. Unit Ready

This status is set when initial seek is completed and goes false when the power is turned off.

b. On Cylinder

This status is et along with Unit Ready and it is cleared but the next seek or RTZ instruction. It is again set along with Seek End on the B Cable when a Seek or RTZ operation is completed. However, it may not be true if a Seek error occurs.

c. Seek Error

This status indicates that a Seek or RTZ operation ended abnormally. In this case, On Cylinder may not be set by B Cable Seek End will be set on. The Seek Error is cleared by an RTZ instruction. Refer to item (c) for detail.

d. Fault

This status indicates that a fault condition exists in the drive. Refer to item (c) for detail. If any seed error has occurred, writing is immediately inhibited and a Fault signal is issued to the control unit. The Fault Status is cleared by Fault Clear (Tag 3 Bit 4).

e. File Protected

File Protected signal, enabled by a switch on the PCB, indicates all tracks are in write-protected status. Attempting to write while this signal is on will cause a fault.

f. AM (Address Mark) Found

This signal is used only in Variable Sector mode, AM Found is an 8-byte pulse which is sent to the control unit after the recognition of a 3-byte DC erased area on the specified tracks when the AM Read instruction is received. Refer to Figure 6.25.

(b) Sector Count Status (by Tag 4)

This status is used in fixed sector mode and valid when the number of sectors per track is less tha 256. This signal is reset by the trailing edge of Index, clocked by the trailing edge of Sector and indicates the current sector address in the drive. Sector Address (Status lines 0 to 7) will be issued to the control unit.

(c) Fault/Seek Error Status 0 to 7

Three-bit binary coded Status 0 to 2 indicate the eight types of Fault, three-bit binary coded Status 3 to 5 indicate the seven types of Seek error as shown in Table 6.3.

Table 6.3 Fault/Seek error status

Status	Status Bit								Fault/Seek Error	
	7	6	5	4	3	2	1	0	Designation	Condition
Fault	X	X	X	X	X	0	0	1	Control Check 1	Indicates a Seek, RTZ or Offset command is issued during busy or Seek Error condition.
	X	X	X	X	X	0	1	0	Control Check 2	Indicates a Read or Write command is issued during a Seek Error, Not Ready and Not On Cylinder condition. Indicates a Write command is issued during Read or Offset condition.
	X	X	X	X	X	0	1	1	Write Off-track	Indicates a write command is issued during off-track condition.
	X	X	X	X	X	1	0	0	Write Unsafe	Indicates a write operation cannot be performed by write circuit fault.
	X	X	X	X	X	1	0	1	Write Protected	Indicates a write command is issued File-protected status.
	X	X	X	X	X	1	1	0	Read/Write Multi	Indicates a multiple head is selected during read or write operation.
	X	1	X	X	X	X	X	X	VCMHT	Indicates Over-Load Current flows on VCM.
	1	X	X	X	X	X	X	X	DMFT	Indicates Over-Load Current flows on DC motor.
Seek Error	X	X	0	0	1	X	X	X	RTZ Time-Out	Indicates an RTZ operation is not terminated within the specified time.
	X	X	0	1	0	X	X	X	Seek Time-Out	Indicates a Seek operation is not terminated within the specified time.
	X	X	0	1	1	X	X	X	Over-Shoot	Indicates the head over-shoots the target cylinder during setting time, or the head moves out during track following sequence in linear mode.
	X	X	0	1	1	X	X	X	Not Speed Good	Indicates a Seek command is issued during Not speed Good condition.
	X	X	1	0	0	X	X	X	Seek Guard Band	Indicates the guard band is detected during seek operation.
	X	X	1	0	1	X	X	X	Linear Mode Guard Band	Indicates the guard band is detected during linear mode.
	X	X	1	1	0	X	X	X	RTZ Outer Guard Band	Indicates the guard band is detected during RTZ mode.
	X	X	1	1	1	X	X	X	Illegal Cylinder	Indicates an illegal cylinder address (<822) is issued by the controller.

(d) Device Type

These status bits indicate the device type code of the drive. Refer to Table 6.4.

Table 6.4 . Device type

	Status 7	Status 6	Status 5	Status 4	Status 3	Status 2	Status 1	Status 0	
	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	
M2343K	0	0	1	1	0	0	1	1	383.4 MB
M2344K	0	0	1	1	0	0	1	0	690.1 MB

(2) Index

This signal is a three-byte pulse which occurs once per revolution and is used for reference in Read/Write operation. The index signal is invalid during initial seek or RTZ operation. Refer to Figure 6.15 for the timings of Index and Sector.

(3) Sector

The Sector mark, a three-byte pulse which occurs 1 to 128 times per track, is derived from the Index signal and Byte Clock of the servo surface. The number of bytes per track is selected by DIP switches. Refer to Subsection 4.6.6.

(4) Busy (Dual Channel Only)

If the drive is already selected and/or reserved, a Busy signal will be issued on the A Cable to the channel attempting the select. This busy signal will remain at this status until Unit Select Tag is negated or the drive is no longer busy. Unit Selected signal should be used to enable in the control unit. Refer to Figure 6.5.

6.2.3 B-cable input signals

(1) Write Data

This line carries NRZ data which is to be written on the disk surface and must be synchronized with Write Clock. Refer to Figure 6.16.

(2) Write Clock

Write Clock is a return signal of 1F Write Clock issued from the drive. Refer to Figure 6.16.

6.2.4 B-cable output signals

(1) 1F Write Clock

This signal is used by the control unit to synchronize Write Data Clock. 1F Write Clock is available during Unit Ready Status except during read operations. However, a fluctuation of 32 bits ±3 bits could occur in the last 4 bytes of Invalid Data. Refer to Figure 6.16.

(2) Read Data

This line transmits the recovered data in the form of NRZ data synchronized with 1F Read Clock. Refer to Figure 6.17.

(3) 1F Read Clock

This line transmits 1F Read Clock. The Read Data is synchronized with 1F Read Clock. Refer to Figure 6.17. This line is valid only during a read operation.

(4) Unit Selected

When the three Unit Select signals (gated by the Unit Select Tag) and the logical address of the drive compare, the status signals are issued from the drive. The Unit Selected signal activates the drivers/receivers on A-cable.

(5) Seek End

Seek End signal indicates that a Seek, RTZ or Offset operation has terminated. This signal may be used as an interrupt to the control unit.

In dual channel operation, the Seek End signal sent the unselected channel will normally be constant-true. However, if while the drive is selected on a channel, and the opposite channel receives a select command, and then the selected channel resets: the Select and Reserve latches on the drive, the Seek End signal sent to the waiting channel will go false for 30 μs.

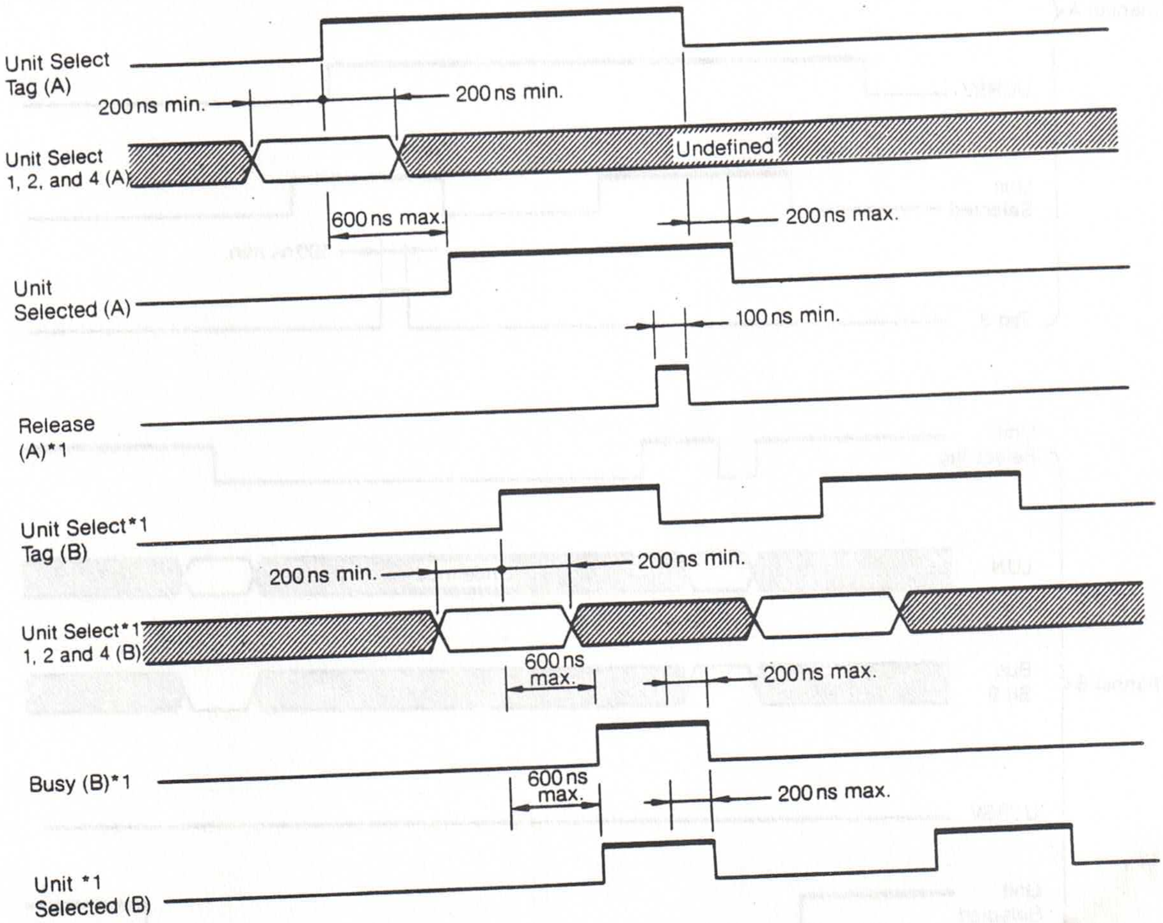
(6) Index/Sector

Exactly the same as A-cable signals.

6.3 Timing

Polarities are defined in positive logic. The shaded area is undefined.

(1) Unit Selection

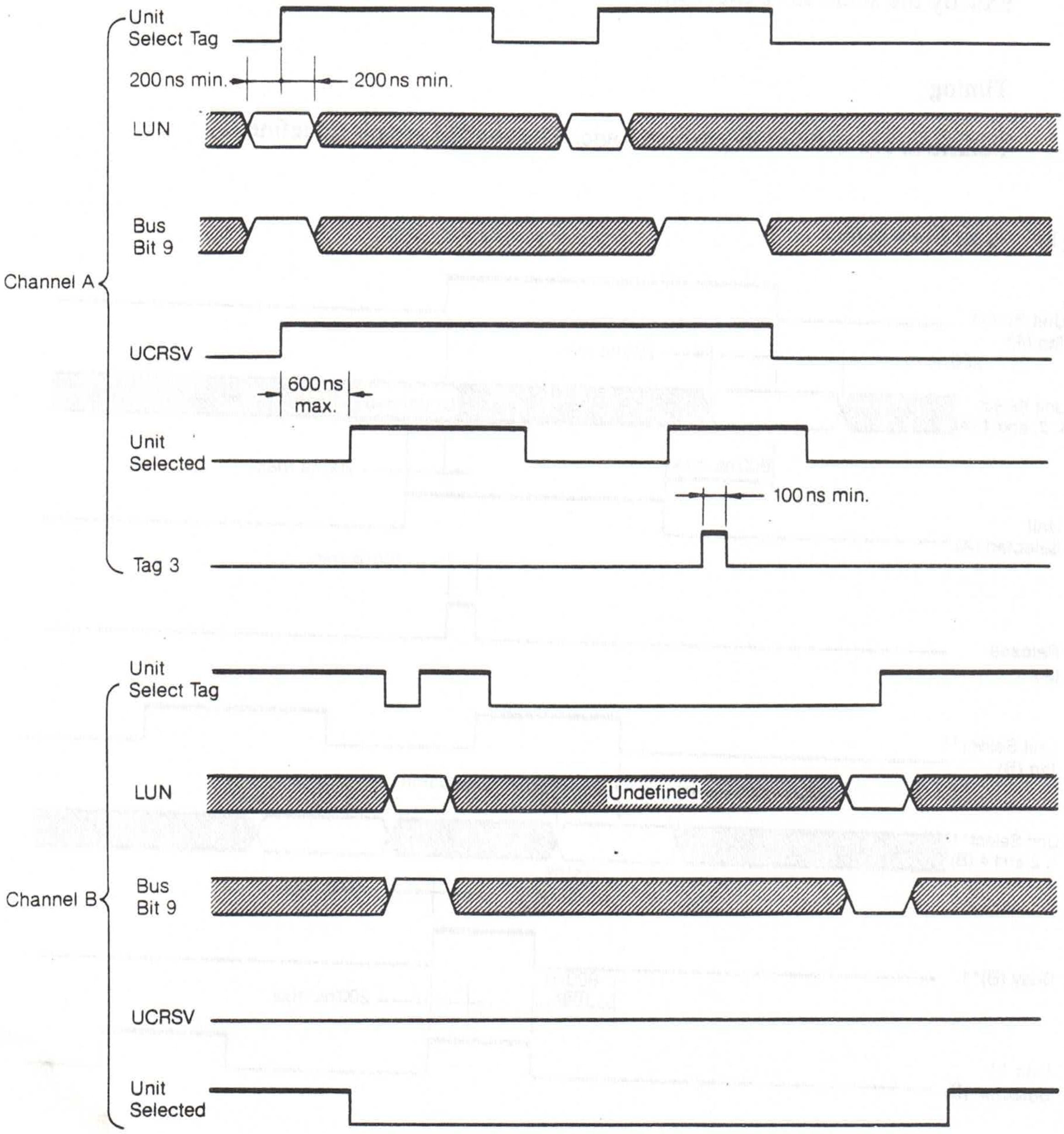


Note:

*1) Dual channel only.

Figure 6.5 Unit Select timing

(2) Priority Select timing (Sample)

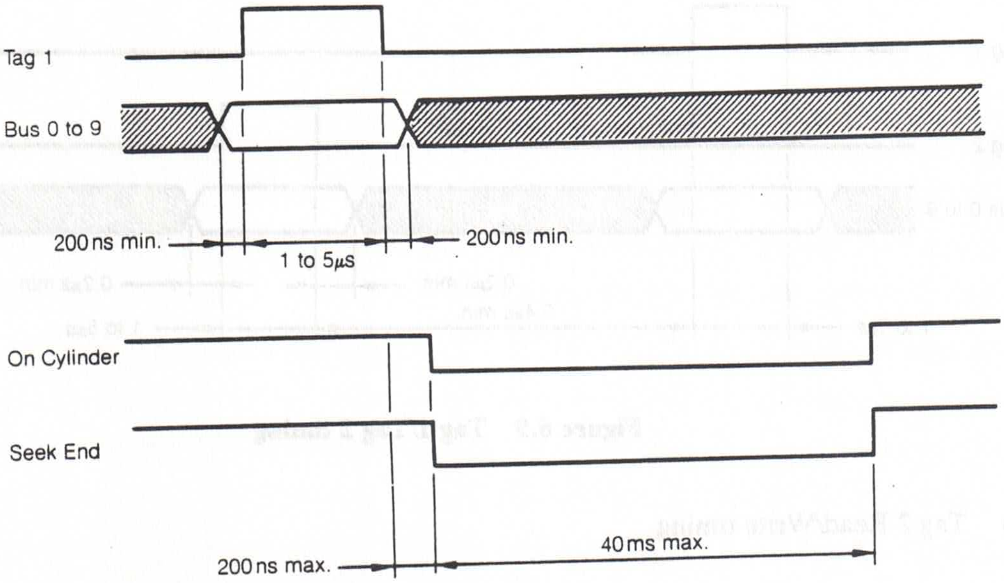


Notes:

1. LUN: Logical Unit Number (Unit Select 1, 2 and 4).
2. UCRSV: Unconditionally Reserved (Priority Selected).
3. Sample Sequence is as follows:
   CHB Selected → CHA Priority Select → CHB Priority Select
   CHA Release → CHB Select

Figure 6.6 Priority Select timing

(3) Seek timing (Tag 1)



Note:

Cylinder address must be valid.

Figure 6.7 Seek timing

(4) Same Cylinder Address

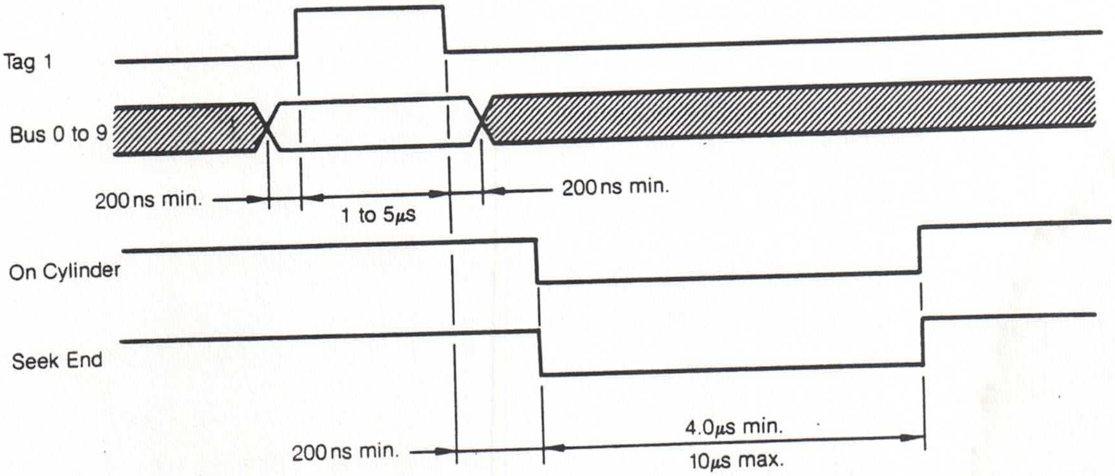


Figure 6.8 Same Cylinder Address

(5) Tag 1/Tag 2 timing

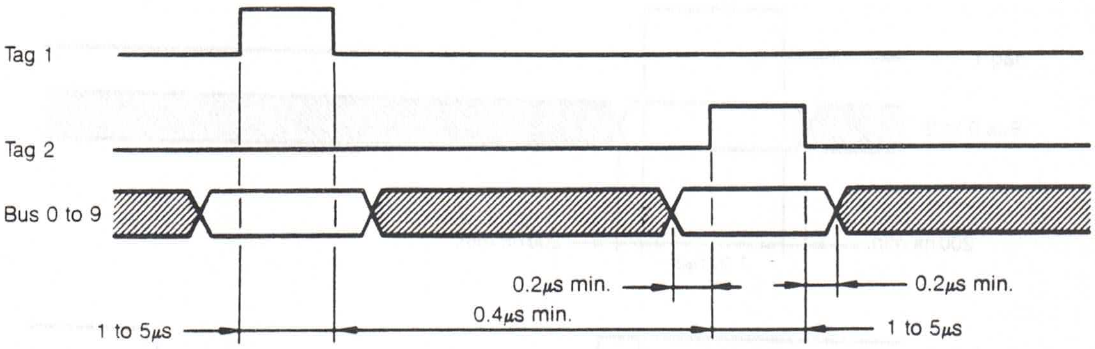


Figure 6.9 Tag 1/Tag 2 timing

(6) Tag 2 Read/Write timing

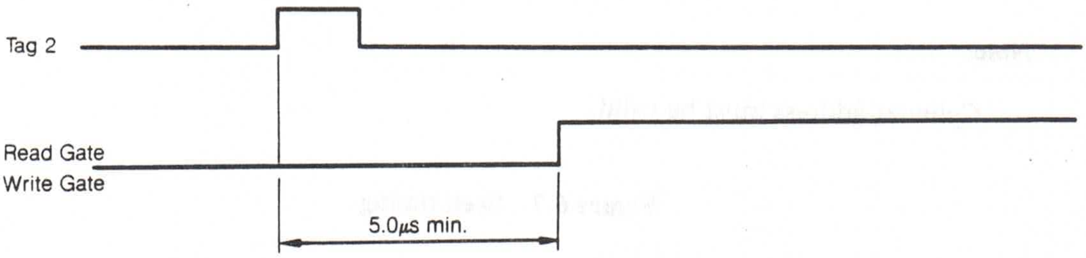
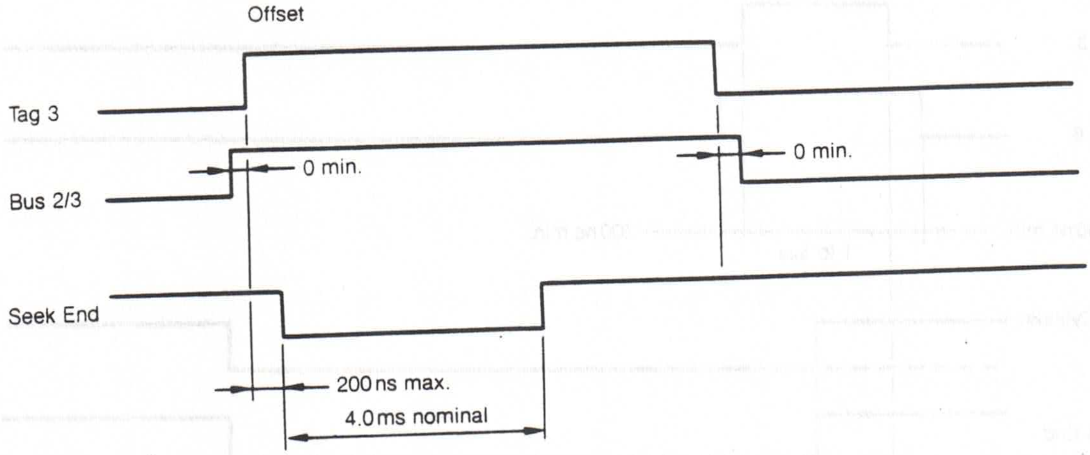


Figure 6.10 Tag 2 Read/Write timing

(7) Offset timing



Note:

The control unit must inhibits the write operation for 4 ms after offset end sequence.

Figure 6.11 Offset timing

(8) Fault Clear timing

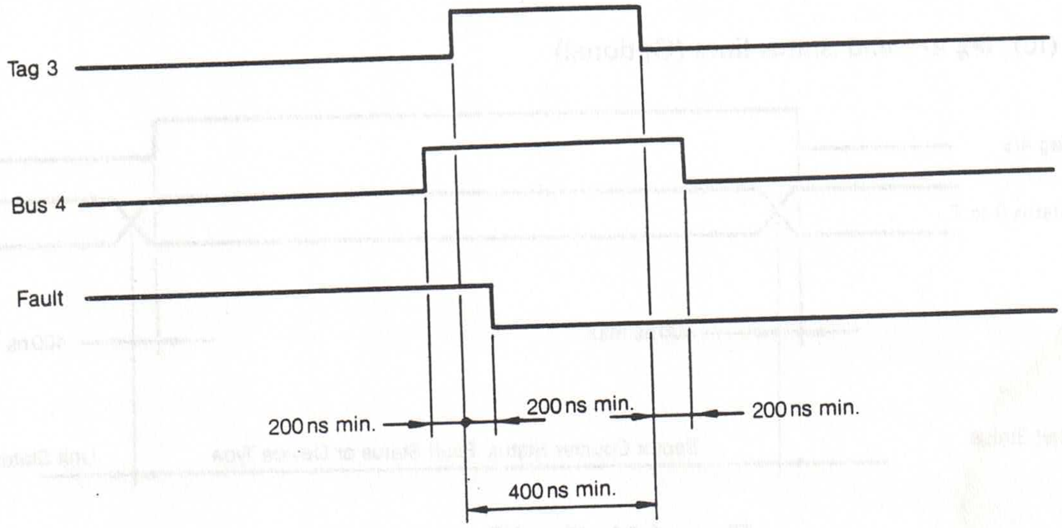


Figure 6.12 Fault clear timing

(9) RTZ timing

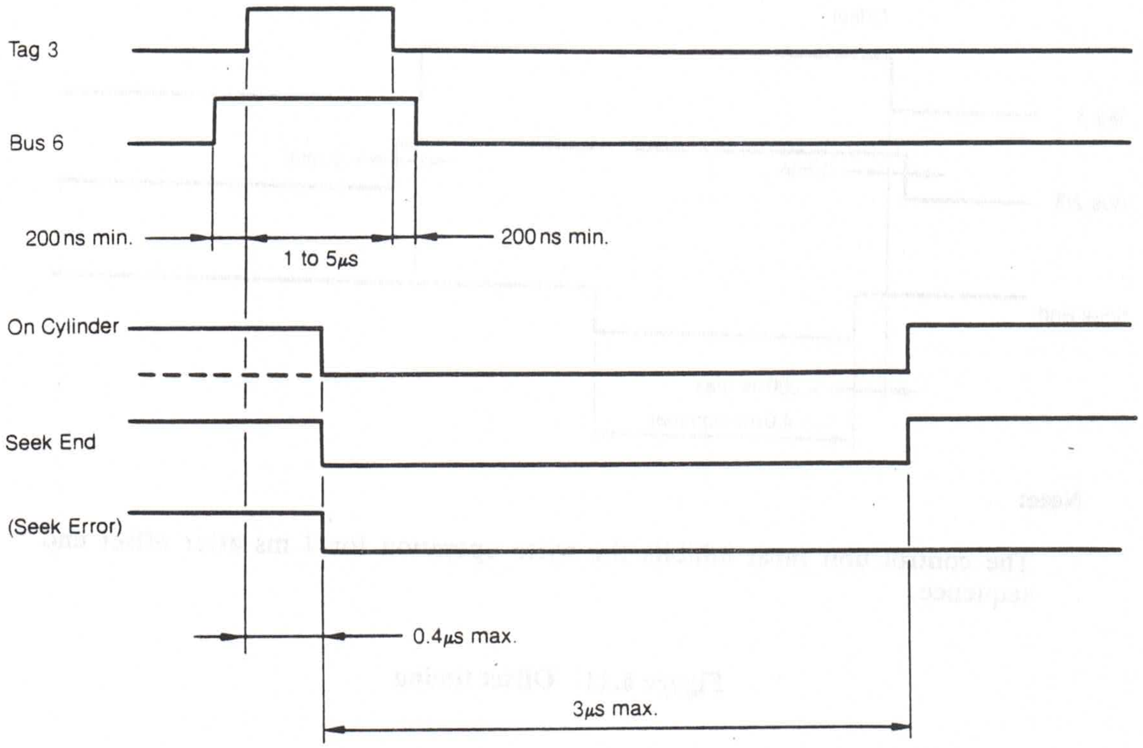


Figure 6.13 RTZ timing

(10) Tag 4/5 and Status lines (Optional)

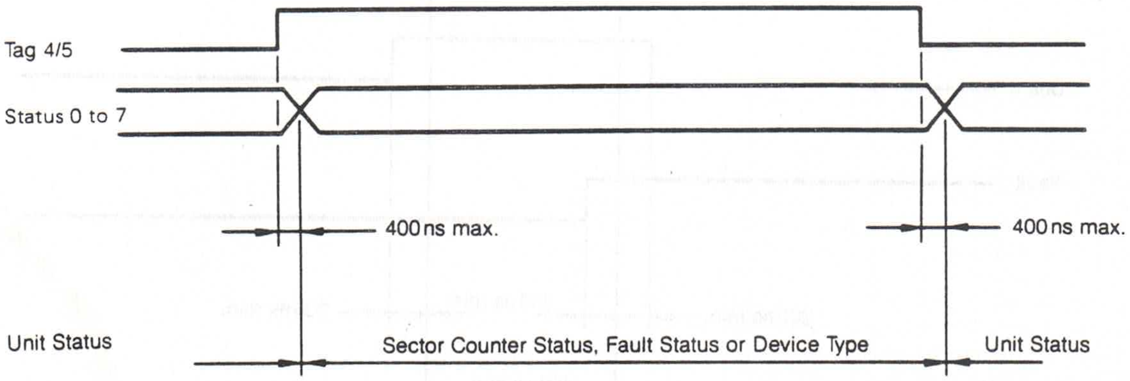


Figure 6.14 Tag 4/5 and Status lines

(11) Index/Sector

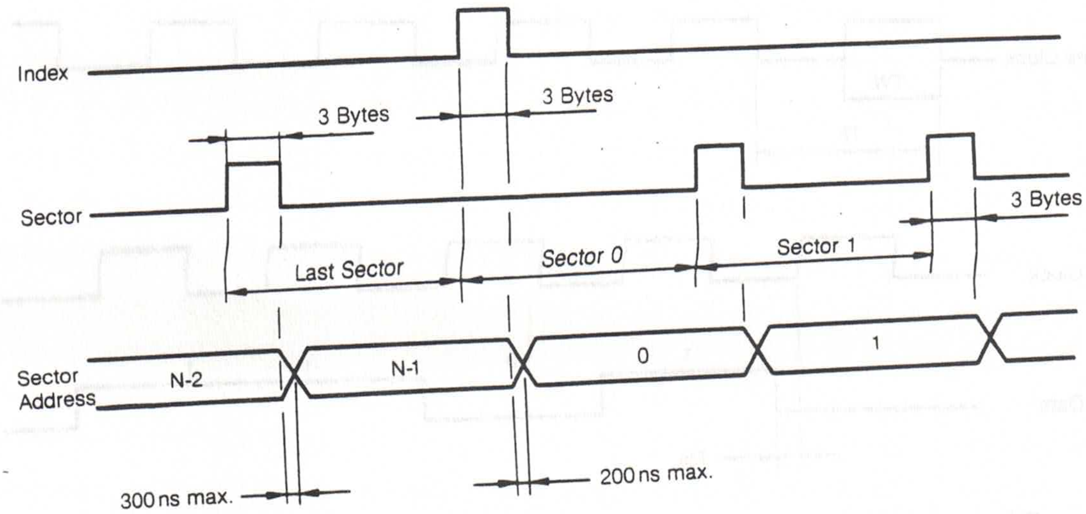
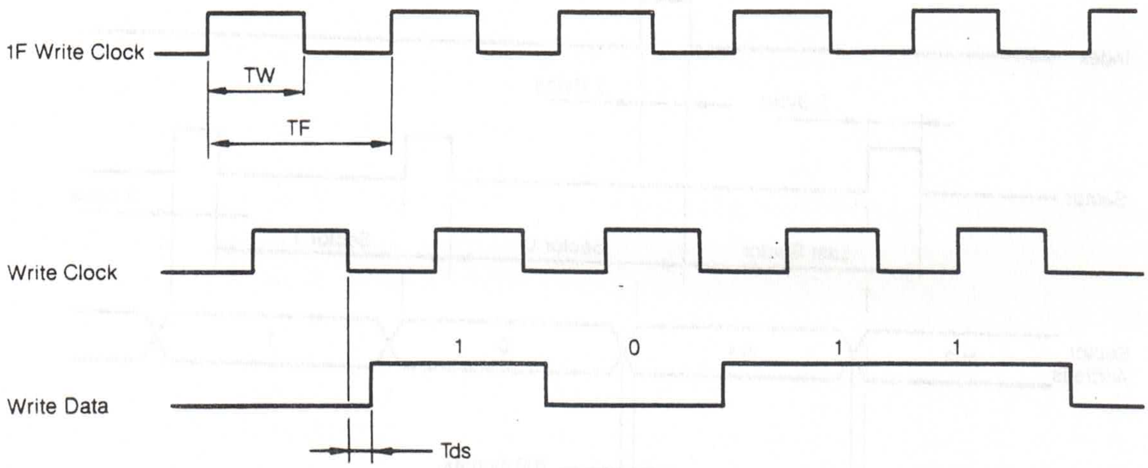


Figure 6.15 Index/Sector timing

(12) 1F Write Clock, Write Data/Write Clock



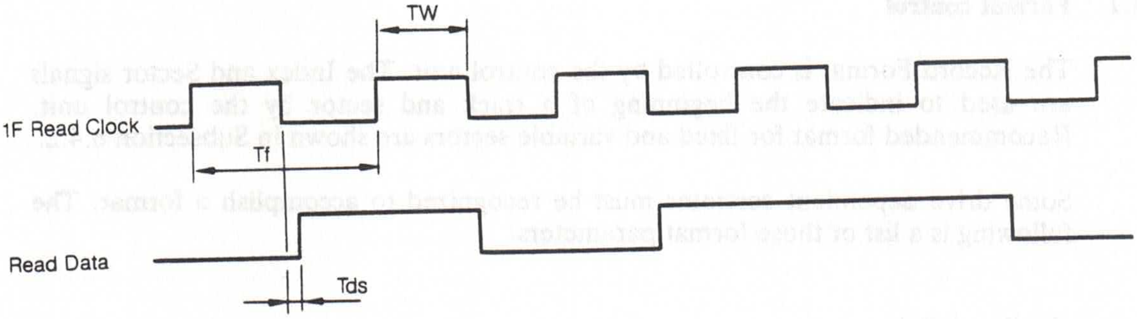
Tf = 50.8 ns ±1 ns
Tw = Tf/2 (25.4 ns ±5 ns)
Tds = 0 ±10 ns

Note:

1. Write Clock/Write Data timing shall be specified at the output connector of the control unit.
2. The permissible value of Tf timing is 2% which includes the disk rotational variation, ±1% and jitter, ±1%.
3. NRZ Write Data from the control unit is phase-compensated and then RLL 2/7 Encoded for writing on the disk surface.

Figure 6.16 1F Write Clock, Write Clock/Write Data

(13) Read Clock/Read Data



Tf = 50.8 ns ±1 ns
Tw = Tf/2
Tds = 3 ns +7 ns/−4 ns

Notes:

1. Read Clock and Read Data timing shall be specified at the output connector of the drive.
2. Read Data signal should be clocked at the rising edge of Read clock and the high speed IC (ex. shottky type) should be used for the clocking circuit (ex. Ser/Des circuit, ECC/CRC circuit) in the control unit.

Figure 6.17 Read Clock/Read Data timing

(14) Channel Ready

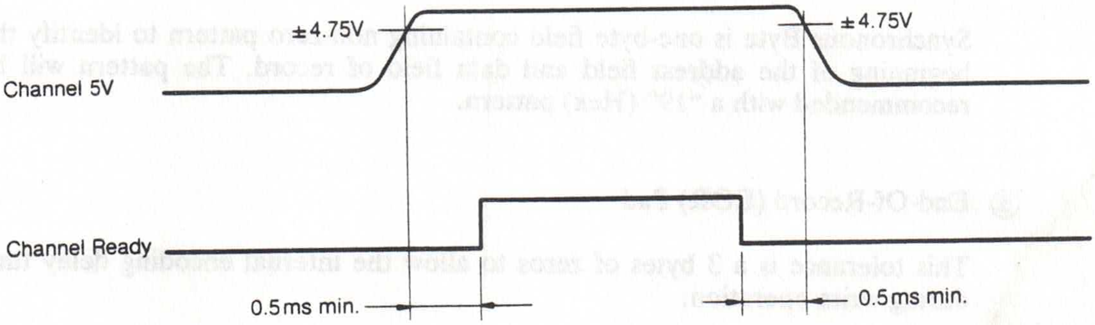


Figure 6.18 Channel Ready timing

6.4 Format

6.4.1 Format control

The Record Format is controlled by the control unit. The Index and Sector signals are used to indicate the beginning of a track and sector by the control unit. Recommended format for fixed and variable sectors are shown in Subsection 6.4.2.

Some drive dependent costrains must be recognized to accomplish a format. The following is a list of those format parameters:

① Gap 1 Tolerance

This 18 bytes tolerance is required for conventional disk pack/cartridge drive. In the M2343K/M2344K, this is not required, however, this tolerance must be provided to allow for head selection or read-after-write transient.

② VFO Fast Synchronization

The synchronization time required to allow the Variable Frequencey Oscillator (VFO) to synchronize is 18 bytes minimum before Synchronous Patterns for the address field and data field.

③ Write Driver Turn On Time

The Write Driver Turn on time is approximately 800 ns. This time has to be accounted for in order to know write splice locations.

④ Synchronous Byte

Synchronous Byte is one-byte field containing non-zero pattern to identify the beginning of the address field and data field of record. The pattern will be recommended with a "19" (Hex) pattern.

⑤ End-Of-Record (EOR) Pad

This tolerance is a 3 bytes of zeros to allow the internal encoding delay time during write operation.

⑥ Gap 3 Tolerance

Gap 3 is 1-byte minimum of zeros to prevent the write turn-off transient.

⑦ Head Select Transient

The control unit must provide a 5 μs minimum delay time between a head select and initiating a read gate. Normally this delay time will be provided by adding zeros within Gap 3 and/or Gap 1 depending the control unit function.

⑧ Read-after-Write Transient

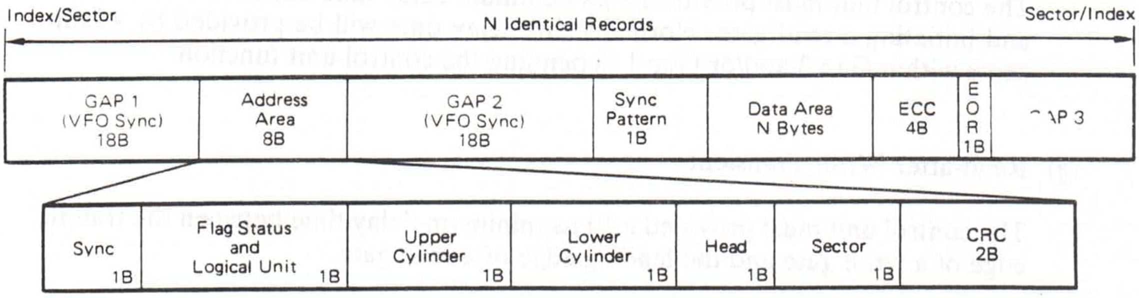
The control unit must provided a 10 μs minimum delay time between the trailing edge of a write gate and the leading edge of a read gate.

Normally this delay time will be provided by adding zeros within Gap 3 and/or Gap 1 depending on the control unit function.

⑨ Read/Write Encoding/Decoding Time

The NRZ write data is encoded into RLL 2/7 write data pulses and written on the specified record during write operation. The RLL 2/7 read data pulse is decoded into NRZ read data and then sent to the control unit during read operation. Through encoding and decoding circuitry, a read data signal will be delayed by approximately 10 bits against a write data.

6.4.2 Fixed Sector format



Example: 128 Sectors/Track

$$\text{Data Area} = \frac{\text{Total Bytes/Track}}{\text{Sector/Track}} - (\text{Gap loss} + \text{Check Bytes})$$

$$= \frac{40{,}960}{128} - (49 + \text{GAP3}) = 256 \text{ bytes}$$

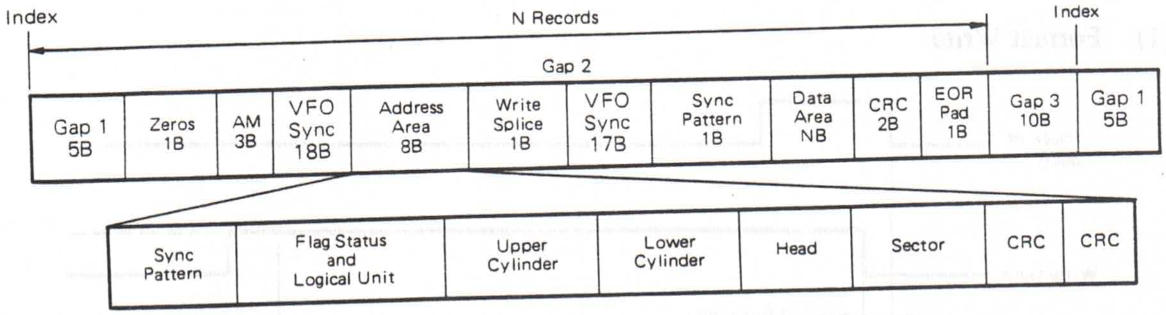
In case of 256 bytes data length, Gap 3 is 15 bytes

$$\text{Track Efficiency} = \frac{256 \text{ bytes} \times 128 \text{ sector}}{40{,}960} \times 100 = 80\%$$

Notes:

1. This format is an example only and may be structured to suit individual requirements.
2. The Sync Byte Sent on the B-cable is recommended to be a "19" (Hex) pattern.
3. Data patterns for Gap 1, VFO Sync., Write Splice EOR Pad and Gap 3 are all "0".
4. Fixed sectors per track may be any number from 1 through 128 and can be selected by setting the configuration switches on the main control circuit PCA.

6.4.3 Variable Sector format



$$\text{Data Area} = \frac{\text{Total Bytes/Track} - \text{Index Loss}}{\text{Records/Track}} - (\text{Sync} + \text{Address Area})$$

Example 1: 64 Records/Track

$$\text{Data Area} = \frac{40960 - 15}{64} - 52 = 587 \text{ bytes/records}$$

$$\text{Track Efficiency} = \frac{578 \times 64}{40960} \times 100 = 91\%$$

Example 2: 256 Records/Track

$$\text{N Records} = \frac{40960 - 15}{256 + 52} = 132 \text{ records/track}$$

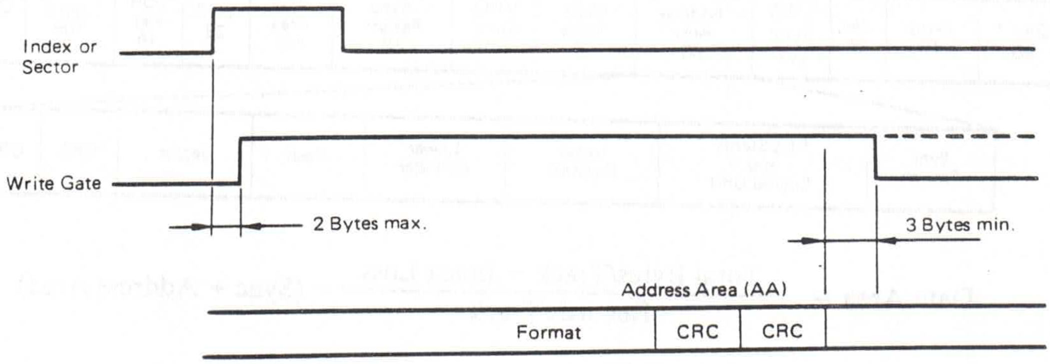
$$\text{Track Efficiency} = \frac{256 \times 132}{40960} = 82\%$$

Note:

This format is an example only and may be structured to suit individual requirements.

6.5 Format Timing Specification

(1) Format Write



Note:

Write Gate may stay on at broken line.

Figure 6.19 Format Write timing

(2) Data Write

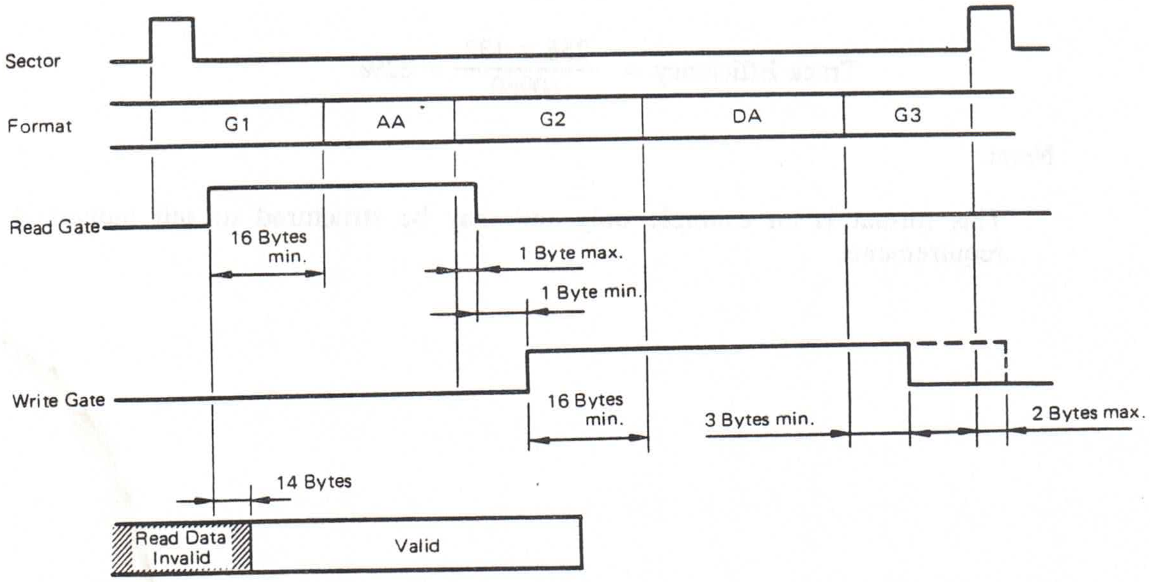
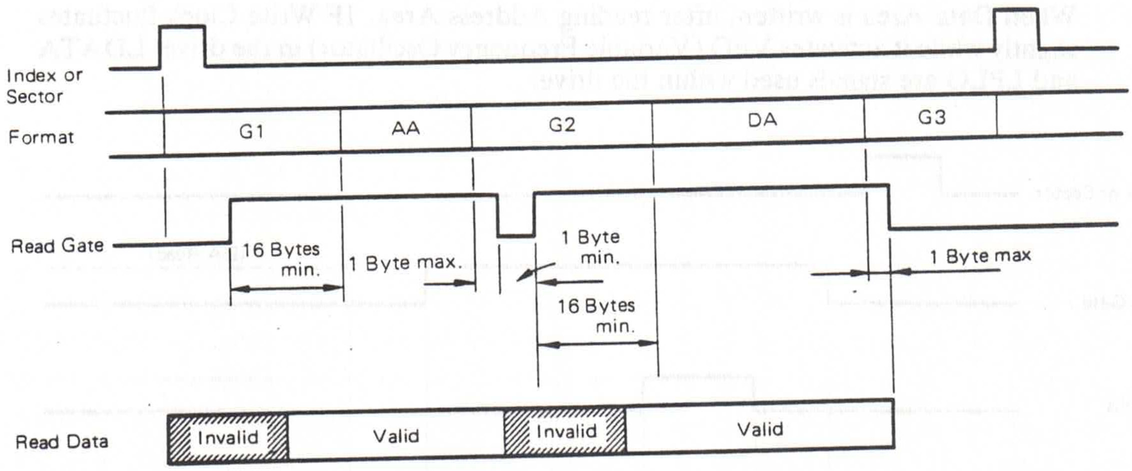


Figure 6.20 Data Write timing

(3) Data Read timing



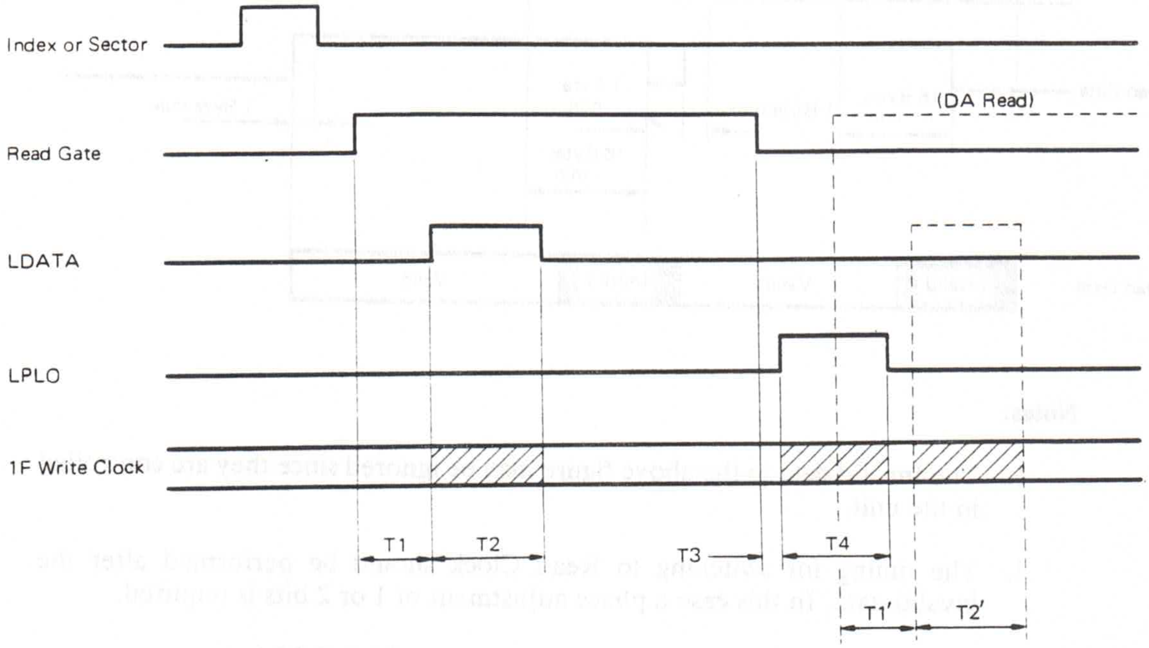
Notes:

1. The Invalid data in the above figure may be ignored since they are controlled in the unit.
2. The timing for switching to Read Clock should be performed after the invalid data. In this case a phase adjustment of 1 or 2 bits is required.
3. Address Area and Data Area each includes a CRC/ECC byte.

Figure 6.21 Data Read timing

(4) 1F Write Clock in reading

When Data Area is written, after reading Address Area, 1F Write Clock fluctuates slightly while it activates VFO (Variable Frequency Oscillator) in the drive. LDATA and LPLO are signals used within the drive.



T1, T1':	56 ±2 bits
T2, T4, T2':	48 bits (6 bytes)
T3:	2 to 8 bits

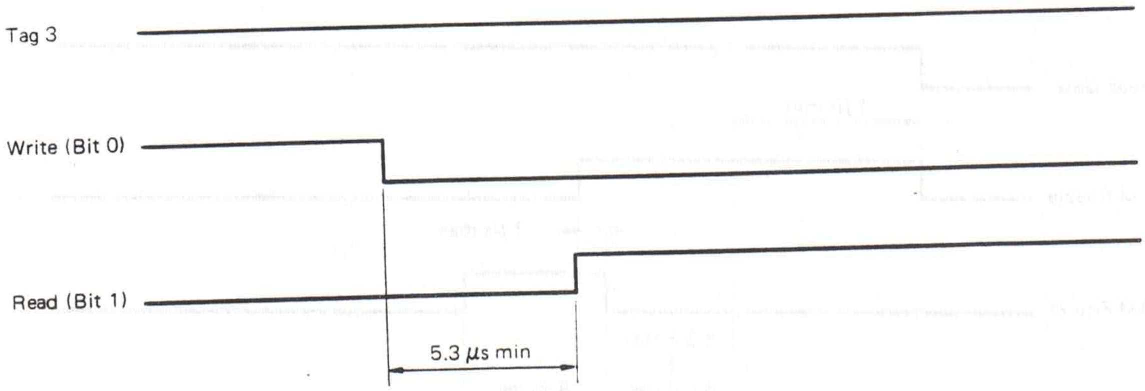
Note:

Shaded area (6 bytes) is equal to 48 ±3 bits of clock count.

Figure 6.22 1F Write Clock in reading

(5) Write-to-Read transient specification

Due to the transient in the read circuit of the unit, Read operation is not possible immediately after Write operation. The timing is specified in this section.



Note:

Tag 2 (Head Select) transient of 5 μs must be considered in controlling Read/Write operation. See Subsection 6.4.1.

Figure 6.23 Write-to-Read transient

(6) AM Write (Variable Mode only)

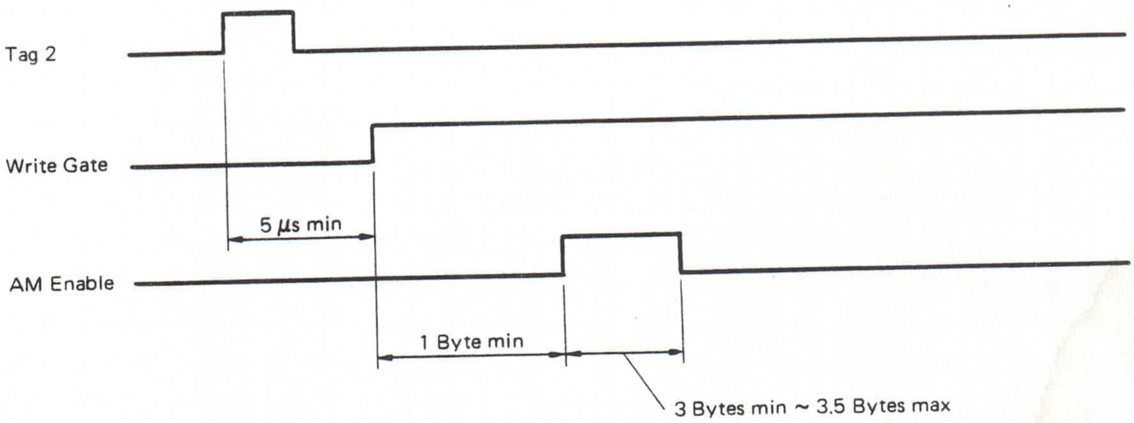


Figure 6.24 AM Write timing

(7) AM Read (Variable Mode only)

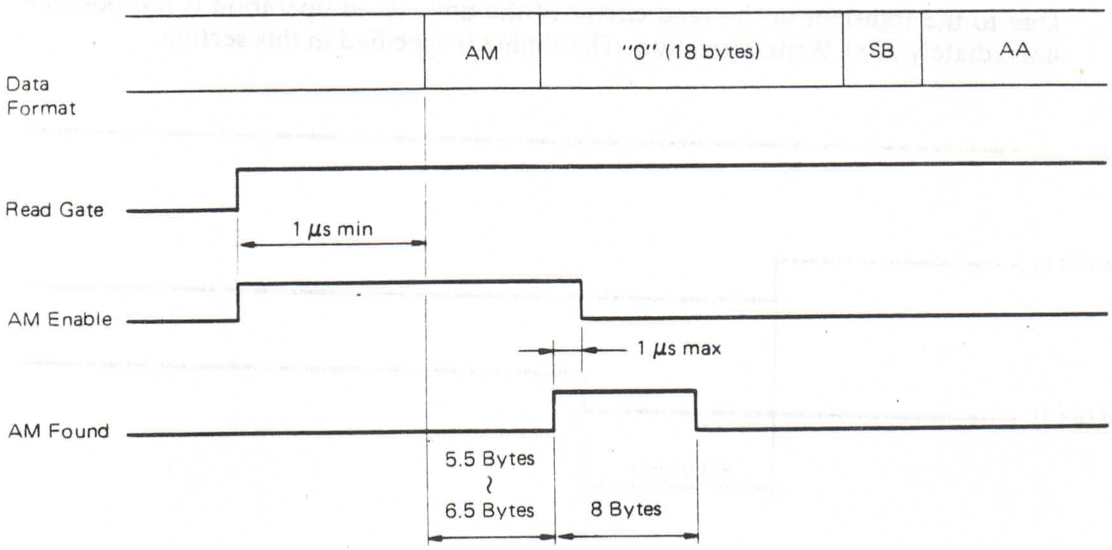


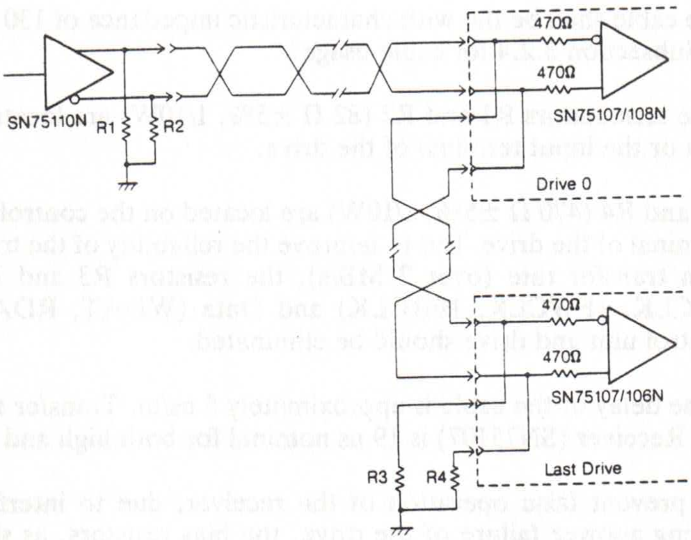
Figure 6.25 AM Read timing

6.6 Signal Transmission Drive/Receiver

Balanced transmission method is used in trasferring signal within the interface. This method is suitable for long range transmission and is not susceptible to external noise.

Driver	SN75110 or equivalent
Receiver	SN75107/SN75108 or equivalent

6.6.1 A-cable (control cable)



Notes:

1. Line terminators R1 and R2 (56 Ω ±5%, 1/10W) are located on the driver side and R3 and R4 (56 Ω ±5%, 1/10W) are located on the receiver side. The line terminators are required on the control unit and the terminator assembly of the last drive.

2. The maximum cable length is 30 meters.

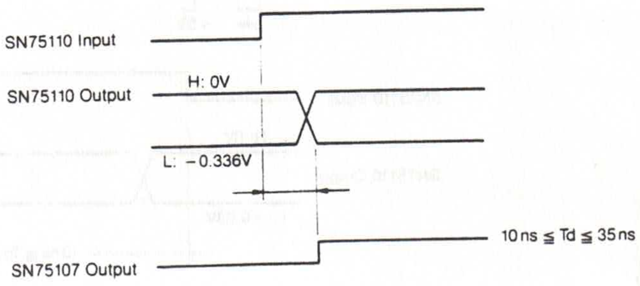
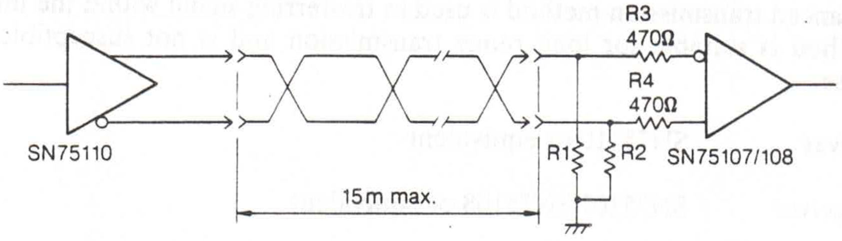


Figure 6.26 A-cable Driver/Receiver

6.6.2 B-cable (data cable)



Notes:

1. The cable shall be flat with characteristic impedance of 130 Ω ± 13 Ω. Refer to Subsection 3.2.4 for cable usage.

2. Line terminators R1 and R2 (82 Ω ±5%, 1/10W) are located on the control unit or the input terminal of the drive.

3. R3 and R4 (470 Ω ±5%, 1/10W) are located on the control unit or the input terminal of the drive. But to improve the reliability of the transmission at the high transfer rate (over 2 MB/s), the resistors R3 and R4 of the Clock (WCLK, 1FWCLK, 1FRCLK) and Data (WDAT, RDAT) lines on the control unit and drive should be eliminated.

4. Time delay of the cable is approximately 5 ns/m. Transfer time and delay of the Receiver (SN75107) is 19 ns nominal for both high and low signals.

5. To prevent false operation of the receiver, due to interface disturbances during apower failure of the drive, the bias resistors, as shown below, are used on the controller side for Unit Selected and Seek End signals.

6. Maximum cable length is 15 meters.

7. R5 and R6 (15 KΩ ±5%, 1/10W) are used to prevent the receiver output signal from oscillating when input signals are both high as follows:

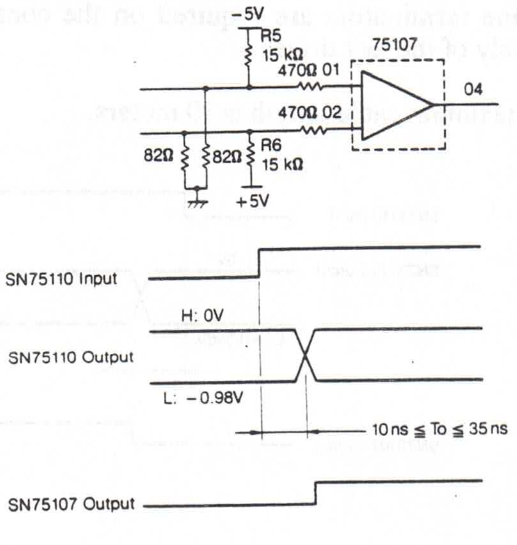


Figure 6.27 B-cable Driver/Receiver

6.6.3 Channel Ready

The Channel Ready signal must be issued to protect data due to interface disturbances during a power failure of the control unit. It is preferable to use some type of bias circuit, i.e. a relay circuit or a circuit using passive elements, in transmitting this signal.

If SN75110 is used as a driver, it is desirable to use two of them in parallel.

Whatever type of circuit is used, as far as this signals is concerned, the driver needs no termination.

6.7 Connector Pin Assignment

6.7.1 A-cable connector

Table 6.5 A-cable pin assignment (60 pos.)

1	Tag 1 L	31	Tag 1 H
2	Tag 2 L	32	Tag 2 H
3	Tag 3 L	33	Tag 3 H
4	Bus 0 L	34	Bus 0 H
5	Bus 1 L	35	Bus 1 H
6	Bus 2 L	36	Bus 2 H
7	Bus 3 L	37	Bus 3 H
8	Bus 4 L	48	Bus 4 H
9	Bus 5 L	39	Bus 5 H
10	Bus 6 L	40	Bus 6 H
11	Bus 7 L	41	Bus 7 H
12	Bus 8 L	42	Bus 8 H
13	Bus 9 L	43	Bus 9 H
14	Channel 1 Ready L	44	Channel Ready H
15	Status 3 L	45	Status 3 H
16	Status 2 L	46	Status 2 H
17	Status 1 L	47	Status 1 H
18	Status 6 L	48	Status 6 H
19	Status 0 L	49	Status 0 H
20	Status 5 L	50	Status 5 H
21	Busy L	51	Busy H
22	Unit Select Tag L	52	Unit Select Tag H
23	Unit Select 1 L	53	Unit Select 1 H
24	Unit Select 2 L	54	Unit Select 2 H
25	Status 7 L	55	Status 7 H
26	Unit Select 4 L	56	Unit Select 4 H
27	Tag 5 L (Selectable)	57	Tag 5 H (Selectable)
28	Status 4 L	58	Status 4 H
29	...	59	...
30	Tag 4 L (Selectable)	60	Tag 4 H (Selectable)

Notes:

1. The function of Tag 4 of Tag 5 signals can be inhibited by a switch.
2. Pin 29 and pin 59 should not be used.
3. Busy signal is used with Dual Port Option only.

6.7.2 B-cable connector

Table 6.6 B-cable pin assignment (26 pos.)

1	GND	14	1F Write Clock H
2	1F Write Clock L	15	GND
3	Read Data L	16	Read Data H
4	GND	17	1F Read Clock H
5	1F Read Clock L	18	GND
6	Write Clock L	19	Write Clock H
7	GND	20	Write Data H
8	Write Data L	21	GND
9	Unit Selected H	22	Unit Selected L
10	Seek End L	23	Seek End H
11	GND	24	Index H
12	Index L	25	GND
13	Sector L	26	Sector H